AUG 6 1913

JOURNAL OF ELECTRICITY

POWER AND GAS

Devoted to the Conversion, Transmission and Distribution of Energy

Entered as second class matter May 7, 1906, at the Post Office at San Francisco, Cal., under the act of Congress March 3, 1879.

VOL. XXXI NO. 5 SAN FRANCISCO, AUGUST 2, 1913 PER COPY, 25 CENTS

THE Y. M. C. A. AS A LOCAL TECHNICAL SCHOOL.

BY W. HAYNES.

ELECTRICITY AND THE ARCHITECT.

BY F. E. WALLIS.

ELECTRIC IRRIGATION, OR THE MOTOR'S CONQUEST OF THE DESERT.

BY W. L. FROST.

DISTRIBUTION SYSTEMS.

BY B. A. ETCHEVERRY.

MATERIALS ADVERTISED IN THIS ISSUE

Batteries
Edison Storage Battery Supply Co.
Electric Storage Battery Co.

Boiler Feed Water Treatment
Dearborn Chemical Co.

Electrical Instruments
Weston Electrical Instrument Co.

Electric Service
General Electric Co.

Heating Appliances
Berkeley Electric Cooker Co.
Simplex Electric Heating Co.

Fuse
D. & W. Fuse Co.

Insulators
Hemingray Glass Co.
Pierson, Roeding Co.
Pittsburgh High Voltage Ins. Co.
Thomas & Sons.

Meters
Westinghouse Elec. & Mfg. Co.

Motors
Century Electric Co.
Crocker-Wheeler Co.
Wagner Electric Co.

Oil Switches
Pierson, Roeding & Co.

Piping
Pittsburgh Piping & Equipment Co.
Shaw-Batcher Pipe Co.

Pumps
Byron Jackson Iron Works

Rail Bonds
Ohio Brass Co.

Sockets
Cutler-Hammer Co.

Subway Boxes
H. W. Johns-Manville Co.

Tool Kits
M. Klein & Sons.

Transformers
General Electric Co.

Transportation
Southern Pacific Co.

Turbines
Pelton Water Wheel Co.

Vacuum Cleaners
Pacific States Electric Co.

Wire (Trolley)
"Phono," Pierson, Roeding & Co.

Wire and Cable
Indiana Rubber Co.
Habirshaw Wire Co.
Okonite Co.
Pierson, Roeding & Co.
Standard Underground Cable Co.
Sprague Electric Co.
New York Insulated Wire Co.

Where to Buy It in the West, Pages 9, 10. **Alphabetical Index to Advertisers, Page 8.**

CALIFORNIA'S
Seal of
Approval
on

and gold medal awarded to

REGINA ELECTRIC VACUUM CLEANERS

over all other makes at the State Fair, Sacramento 1912, in recognition of their simplicity, durability ease of operation, thoroughness of work performance and the great variety of uses to which they may be applied.

The highest result of the scientific study and application of vacuum principles.

The dust bag is enclosed from view beneath the intake and the motor, protecting the working parts from dust interference, yet permitting the fullest action of the suction apparatus.

Light Running — Compact — Sanitary

Now is your opportunity for a live agency special.
Get our catalogue and data.

PACIFIC STATES ELECTRIC CO.

The Modern Electrical Supply House

Distributors for the Pacific Coast

SAN FRANCISCO OAKLAND LOS ANGELES PORTLAND SEATTLE

THE PACIFIC STATES
ELECTRIC CO.
SERVES THE
PACIFIC COAST

©CLB288456

JOURNAL OF ELECTRICITY
POWER AND GAS
Devoted to the Conversion, Transmission and Distribution of Energy

VOLUME XXXI SAN FRANCISCO, AUGUST 2, 1913 NUMBER 5

[COPYRIGHT 1913 BY TECHNICAL PUBLISHING COMPANY]

THE Y. M. C. A. AS A LOCAL TECHNICAL SCHOOL

BY W. HAYNES.

Electrical Laboratory at Portland Y. M. C. A.

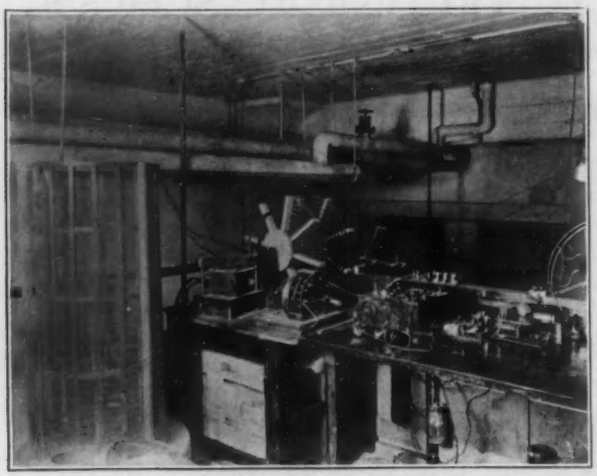
The tendency of up-to-date educational institutions, both public and private, is toward combination of similar schools and courses. Communities more than ever before are questioning the legitimacy of any enterprise which seeks public support, and on the other hand, if a real need is found, these same communities respond more willingly than ever before.

The response, however, is generally conditioned upon the deep seated principles of business efficiency, which have been shown to hold wherever large sums of money are expended. Between these popular beliefs and the conservative views held by the association's board of management, success can be hoped for only the most worthy undertakings. It must be remembered that this board is generally composed of men who have succeeded in their own particular business enterprises, that they are responsible for raising the association's funds and that they are the court of last appeal on questions of additional expense.

Three years ago the educational department of the Portland, Oregon, Young Men's Christian Association felt that a real need existed for a high grade course in certain electrical engineering subjects. For many years the association had given a course in "electricity." This course was about equivalent to the section of "electricity and magnetism" given in an ordinary course of high school physics. In order to give a course which would be an actual benefit to the students, a laboratory was seen to be indispensable. Upon investigation it was found that a desirable equipment for properly demonstrating engineering phenomena would cost between four and five thousand

dollars. Clearly this expenditure could not be made without the sanction of the above mentioned board. The essence of the arguments made to secure this appropriation will perhaps give a clearer conception of the problem from the association's standpoint than is held by the average layman.

Many men begin work with an electric company without a technical education and in the discharge of their duties "make good" and are advanced to a slightly better position. These men are frequently made "straw bosses" and find that they are called upon to decide certain technical questions. If they decide rightly, they strengthen their position with the company, and their men. If they fail in any serious case, they are either discharged, reduced in rank or at least



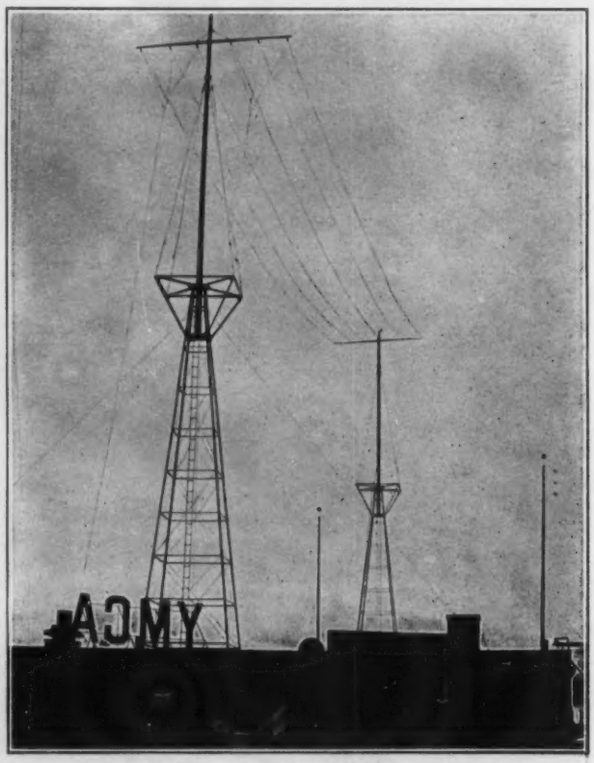
5 kw. Wireless Telegraph Set.

embarrassed before their subordinates and superior officers. Another class is represented by bookkeepers, inspectors, agents, linemen, etc., of electrical companies. They do not need a full university course in electrical engineering, but each requires special training along some particular line, generally a non-mathematical treatment of a single branch of electrical engineering considered in its broader sense. The constituents of these classes cannot enter a university for one or more of the following reasons:

Some haven't enough elementary education. A good many are without even a full grammar school education. Some cannot afford the expense attendant upon college education. Some are married and have families which demand the salary or wages of the husbands. Some are supporting widowed mothers and sisters, often supporting younger children while attending public schools. Some have graduated from colleges of engineering before, but being out of the profession for several years find that a review of certain subjects will aid them in their work. Others have graduated from colleges whose teachers were not practical electrical engineers, and after meeting real problems in actual practice find themselves too weak and untrained to work in confidence. Some have tried to learn electrical engineering by correspondence, and discovered the need of well directed laboratory work.

All these classes of men and many more have presented their case to the Young Men's Christian Association, as the one institution which is free to act according to its conception of men's needs. If the association could install the necessary equipment, secure the proper faculty and give the course at such times and prices as the prospective students could meet; it would serve a large and most worthy class in its locality.

Suffice it to say that the board approved the plans of the educational department and the electrical department was organized. The best room in the building was selected and fitted up as the electrical laboratory. The equipment now on hand is worth something over four thousand dollars, with approximately seven hundred dollars worth of equipment yet to be secured. Most of the apparatus on hand is new and up-to-date. In fact, most of the equipment was made especially



Aerials for Wireless Telegraphy.

for this laboratory and similar to that which may be seen in any of the regular engineering laboratories connected with our colleges.

Another instance of the association's meeting a popular demand was just after the Titanic disaster, when many persons applied for a good course in wireless telegraphy. Again the board provided the funds for purchasing a fourteen hundred dollar equipment. One of the illustrations shows the 5 kw. sending and receiving set. This set is a regular commercial set, and so far as we know, is the best wireless set owned by any Young Men's Christian Association in the world. Another shows the aerial used for the wireless station. It consists of two steel towers, 400 ft. apart and hold the aerial 180 ft. above the streets.

The growth of the electrical school is indicated by the increase in enrollment from 53 in 1911 to 68 in 1912 and 88 in 1913.

HYDRAULICS I.

(The Bernouilli Theorem.)

BY OTTO B. GOLDMAN.

In all of the following we assume that the fluid is incompressible and free from friction or viscosity. Starting first with the Bernouilli theorem, which is simply a statement of the conservation of energy, we have as usually given

$$Z + \frac{P}{W} + \frac{V^2}{2g} = H, \text{ a constant} \quad \ldots\ldots\ldots (1)$$

Where Z is the elevation afore datum, P the absolute pressure, V, the velocity, and H, what might be called the absolute head.

$$P = p_o + p \quad \ldots\ldots\ldots (2)$$

$$\text{and } H = \frac{p_o}{W} + h \quad \ldots\ldots\ldots (3)$$

Where p is the gauge pressure.

p_o is the atmospheric pressure.

h is the actual head.

Substituting in (1) we get a simpler and more practical form of this equation, viz:

$$Z + \frac{p_o}{W} + \frac{p}{V} + \frac{V^2}{2g} = \frac{p_o}{W} + h$$

$$Z + \frac{p}{W} + \frac{V^2}{2g} = h \quad \ldots\ldots\ldots (4)$$

Assuming in the following, for simplicity, that the axis of the passage is on the datum line, we get

$$Z = O$$

$$\frac{p}{W} + \frac{V^2}{2g} = h \quad \ldots\ldots\ldots (5)$$

$$\text{or } V = \sqrt{2g}\ (h - \frac{p}{W}) \quad \ldots\ldots\ldots (6$$

in which g, h and W are constants.

When $p = O$

$$V = \sqrt{2gh} \quad \ldots\ldots\ldots (7)$$

which is the velocity of a body falling under the influence of gravity, freely in a vacuum and is therefore the maximum value that V can obtain. At this point all the energy has been converted into velocity energy.

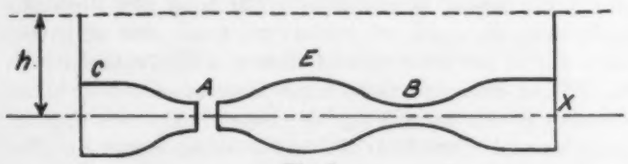


Fig. 1

In the sketch Fig. 1, the area at A is such that $V = \sqrt{2gh}$, and therefore $p = O$.

Many treatises on hydraulics assume that we can make a fluid fall faster than $V = \sqrt{2gh}$ by assuming at a point B, Fig. 1, that the area is less than that at A, as or example in Bovey's Hydraulics, page 15. However the assumption, that he makes is that inasmuch as a certain quantity of fluid passes at A, the same quantity must pass at B, which is of course an error. The assumption seems to be made to avoid spilling water at A. If we assume the distance C, B to be zero, under Borey's assumption, we would get a contradiction of Torricelli's Theorem. So therefore a negative pressure at B cannot be obtained except we assume frictional resistance and the consequent conversion of part of the velocity energy.

Electric maturing of cheese is employed by a Rotterdam firm, who subject a fresh cheese to an alternating current for 24 hours to give it all the properties of a fine two-year-old cheese.

Ammonia bombs are being tried out on some of the national forests for the purpose of extinguishing forest fires. They are said to have worked well in the case of brush fires where the fire-fighters find difficulty in getting near enough to the burning area to beat out the flames. Each bomb exploded will extinguish fire in a circle of about five yards in diameter.

The Western Pacific Railway has instructed its engineers to report fires along the right-of-way where it traverses the Plumas national forest, California. The location of fires is indicated on a card dropped by the engineer or fireman to the next section crew met after the fire is discovered. It is then the duty of part of the section crew to go back on handcars or speeders and put out the blaze.

The heating of screw socket lampholders as investigated by the National Physical Laboratory of England, is almost entirely due to the heat dissipated by the lamp or radiator, and has little to do with the energy lost at the contacts, the latter being neglible unless the holder becomes defective. Such sockets can satisfactorily transmit as much as 1000 watts, whereas bayonet holders are not satisfactory for over 250 watts. Whereas tested temperatures as high as 120 degrees do not damage the sockets, the effect of the heat on insulation of incoming cables is likely to be serious.

Forest Service permits for power development in California have been issued by the secretary of agriculture to the Pacific Light & Power Corporation of Los Angeles, California, to construct and operate a series of power plants in the Sierra national forest. The company plans to build four power houses, two reservoirs, and twenty-five miles of cement-lined tunnels. On account of the magnitude of the construction work and the amount of power to be disposed of, the permit provides for construction extending over a period of twelve years. Under a temporary permit the company has already nearly completed the first step of this development, known as the "Big Creek Project." The power will be transmitted over a double steel tower line strung with stranded aluminum cables and at a pressure of 150,000 volts.

ELECTRICITY AND THE ARCHITECT.

BY FRANK E. WALLIS.

[The relations which should exist between the architect and the engineer have seldom been so well presented as in Mr. Wallis' address at the recent conference of the Society for Electrical Development. With slight modifications they are published herewith.—The Editor.]

Light is the fundamental source of design and composition in architecture, high lights, shades and shadows being the pigments with which the architect expresses himself. Remembering that the Greek temples and the Gothic cathedrals were designed by architects who depended on the light of the sun for the lead in their pencils, electrical men must appreciate the importance of their inventive powers, as they have practically formed a light trust in competition with the Almighty, and natural light is useful today only for a minor portion of our waking hours.

The modern architect must, when designing and composing his interiors and his exteriors of homes, churches, public buildings and offices, take under careful advisement the use and misuse of light, and in designing his cornices, his moldings and his solids he must, in lieu of a pencil tipped with sunlight, supply himself with an electric light point.

The electrical engineer, however, in his efforts to parallel the light of the sun, has forgotten the shadow in his struggle for artificial daylight. This may be extremely useful and sane in many places, but forbear, I beg of you, the violation of the law which gives us the subtle shades and shadows, fleeting mysterious, and housing dreams and fairies, the inspiration of song and story for the poet and the artist since the world was young.

Remember the story of the efficiency engineer with his stop watch held on a couple of young people kissing. "You have used sixteen motions for that kiss, when it should have been done in two," forgetting that the fourteen love pats were worth more than the kiss, and so that shadows and shades are of more value than the perfect light.

In addition I want to suggest the necessity of some knowledge of the styles and of some of the laws of architecture so that you may comprehend to some extent the desire of the architect to soften or to accentuate his work with light and her sister shade, and that you may at the same time join with him in the development of good architecture and of good business.

In the great modern renaissance in the arts and sciences where the city authorities of this country are planning their great civic centers of magnificent court houses and monumental city halls, light, properly designed and properly placed, is a most important factor, but a factor that is more or less neglected. The architects of the Panama Exposition are designing great courts surrounded by facades with monuments, fountains and sunken gardens which will be seen and appreciated by the public during the greater portion of the time with the aid of your substitute for God's sunlight. Electrical men should insist on the recognition of their high place in the councils of trained imagination and should demand some share of the glory which comes from the result of their deliberations.

I would suggest that the Society for Electrical Development appoint a committee to consult in some official capacity with the American Institute of Architects. This society, with the central body in Washington, made up of permanent and working committees on competition, on education, and on laws, has chapters throughout the United States, each chapter working in the same manner in its own locality. Consulted by presidents, by governors, and by the mayors of cities, the society has done work of a great educational value. I, myself, am a Fellow of the Institute and know from the inside the broad-gauged co-operative work which is being done, and I am sure that through the official monthly publication of the Institute or through some method which only such an organization as yours could devise, co-operation could be had where the question of education could be developed. Care should be taken, however, to approach this question only through the higher channels of your mind, for the Institute develops gooseflesh at the mere mention of commercialism, being ultra-professional, and wisely so.

All of us will do better work when we do it in a broad-minded spirit of co-operation and the returns, both financial and otherwise, will be greater according to the greatness of our ideals.

Let me also beg of you as a practicing architect with the peculiar difficulties which always surround our profession, to send your gospel of more light, and better light, of heat and power, and the economies of electricity, the enemy of disease, of crime and of barbarism, to our public officials and to our clients, so that you may enjoy with us the game of life and light and color.

For according to the quality of your offering to the real civilization, so shall its returns be to you.

"In the ranks of industrialism the baton of the field marshal is at the bottom of every recruit's knapsack, although not everyone has the wit to find it."

I had an interesting and instructive visit with Mr. Leon Gaster while in London this winter. He is doing great work both with the Continental governments and with the British parliament on efficiency lighting in factories and workshops. He remarks that the boards of health seem to care more for the posterior end of the alimentary canal than for the windows of the soul, and he has insisted that the various boards of health should consider carefully the effect of light on the health of the workman.

I am now going to presume on my position as a guest and criticize you. My premises are these: While the composer in form, called by the conventional the artist, works with his trained and fluid imagination, he does so subject to fixed and scientific laws which are the result of time and study, and which have been subject to the most jealous scrutiny. It is because of his knowledge of these fixed laws that he admires and marvels at the work of the engineer. The engineer, illuminating or otherwise, makes little, if any, allowance for the excited enthusiasm of the man who composes, knowing the laws but playing with them, for he frequently confuses this exhilaration and keen expression of love with the uncertain and the

false, though sometimes helpful, inspiration which comes from the long bottle. And in addition, the artist, in his mind, is most frequently queer.

Now the man who creates feels this and resents it, and very naturally shys from an association with this sort of scorn.

You men of the central stations, of the manufactories, of contractors and of the sales departments must know that a close relation between yourselves and the architects can only result in economy of construction, in the development of each portion of the work, in added profits to all of us, and to an increase in the returns to the owner on his investment.

We have in our office at the present time a couple of factories, an office building, a loft building, some country houses, some landscape work, a laboratory, and odds and ends of consideration and alteration. All of these problems are worked out under the same formula and with the assistance of engineers of the various requirements, and of clever salesmen and supply men. We architects want co-operation, and this criticism suggests that while you should learn something of us, that we should also learn from you and welcome your data and your suggestions.

Finally, I would like to grow a little personal with you. I am one of those whom men call, to my sorrow, an artistic man, but only because I have the love of form and color. I have wandered among the old and the new, having no prejudices and no preconceived notions, although I have made in my peregrinations a collection of clients and added to my library on human nature.

I have gathered both cash and credit, and as well, the friendship of some of the members of your organization. There I have found men of all types; men with broad views and men with hungry pockets, men who will live and men who lose, men as clever as the fox of Richelieu and men as loggy as the sow of despondency.

I have visions of your dreams and knowledge of your difficulties, and I have this message for the real men who have a desire for success through their business association. In my opinion you are playing the big thing. You have the power of happiness in your hands, both for you and your families and the world. Play the big game and play it to the limit of your powers. You have all the essentials of life in your palms, heat, power and light. Without them we relapse into barbarism and to you, rather than to the ministers of the gospel, we look for salvation and progress. Study the broad way and avoid the petty. Realize that yours is the method and the manner which will guarantee big returns, in warmth from your control of heat, in progress because you have power, and in light and love, for from you we must get all the joy of life. You owe to the civilization of the future more, much more, than the civilization of the past has given to you, and you are given a privilege which is not given to men of other business.

You are parallel with nature and with the Almighty. Play the game or lose yourself in the loneliness of failure and of self-prostitution; for when you play the game and play it big you must be insured the big profits, and this need not necessarily mean an enlarged bank account.

ELECTRIC IRRIGATION OR THE MOTOR'S CONQUEST OF THE DESERT.

BY W. L. FROST.[1]

Come and we will stand on Smiley Heights and I will point to you the miracle of electric irrigation and tell you a story of the chemistry of water and soil.

Below us are the streets of Redlands, and stretching to the north and the south and the east and the west are the citrus groves—the glory and pride of the southwest. They wear a perennial verdure. Dotted among them are spots of lighter green. These are the walnuts, the peaches, apricots, the plums, the apples, the alfalfa, the berries, the vegetable gardens and the vineyards of the California grape.

Look again—look sharper. Focus these field glasses on the groves and fields and gardens. The landscape seems set in a cobweb of silver. It is the July sun shimmering on the irrigation canals and the lateral trenches that carry the life-giving waters to the roots of growing things. The prospect pleases you? It has pleased many. Yes, these wonderful productive lands are valuable from a commercial standpoint. They combine good business and unique beauty. They range from two thousand dollars and up per acre.

Search the old Spanish records and you will find that once they sold for as low as twenty cents an acre and we are told that they were unprofitable at that ridiculous price. What has wrought this wonderful change? The art of irrigation. Practically all that you see before you is under electric irrigation by power supplied by the Southern California Edison Company. You can follow the power lines of this company through the seven counties of Southern California and you will see the picture that I am pointing out to you duplicated in full fifty valleys. No, the art of irrigation or science if you prefer the term, did not spring into its present perfection at one bound. Like most great achievements it took time and study and courage and patience to develop—some sixty odd years as its history runs in Southern California.

It is true that Father Junipero Serro and his Franciscan Brothers watered by artificial methods the gardens about their missions, but their methods were nearly as primitive as those of Pharaoh's slaves who grew their crops where the Nile had overflowed its banks. According to the legend as it has been told to me—one Captain Jefferson Hunt, on disbanding his company of Mormon volunteers at the close of our war with Mexico, passed through San Bernardino Valley on his way back to Utah, and noting the rank growth of vegetation along the water courses, told of what he had seen to Brigham Young. This prophet, anxious at that period to expand the boundaries of his church, and having by irrigation successfully re-claimed the arid lands about the Great Salt Lake, sent out a company of some five hundred of the faithful to colonize the valley of which Hunt had so glowingly reported. The first detachment of this band crossed the Cajon pass and encamped near San Bernardino on June 10, 1851. By damming the mountain streams that came roaring down into the

[1]District Agent Southern California Edison Company, Redlands, Cal.

valleys and diverting the water through lateral trenches, these Mormon colonists put the low levels under irrigation and intensive and profitable cultivation. Chaparall, sagebrush and grease wood vanished before their intelligent tillage and great prosperity, seemed at hand in the year 1858, when gentile hostilities threatened the Mormon hierarchy and the prophet issued an edict calling his wandering children back to Zion to defend the Church, and most of them obeyed. So ended what is known as the Mormon era, which introduced our systematic irrigation.

Following the Mormons came the Gringos, as all except those of the Spanish race were then termed. They bought the cultivated acres of the departing Saints at bargain prices, and they extended the trenches and dammed the rivers at higher levels, and spread the waters on practically all of the land over which it would flow through open trenches. Impounding the flow of the rivers in reservoirs and forcing the water by gravity, in standpipes, to higher levels, was the next expedient for enlarging the sphere of irrigation, but this had its limitation. Excepting under unusual topographical conditions gravity irrigation is the most wasteful of waters. Underlying nearly all of Southern California are subterranean water basins which can be tapped at varying depths by wells. This subterranean water swollen by the seepage from irrigated acres flows down to the ocean and is lost forever to the purposes of man.

Raising the waters from canals and wells was the next step in the extension of the early irrigation system. The ancient windmill with its gaily painted blades—picturesque; but clattering and intermittent, was the first power to drive the pumps that lifted the water, but winds were lazy and uncertain and often the orchardist was obliged to watch the leaves and buds of his young trees wither, while like a becalmed mariner he prayed for rain, but in spite of all of its crude disadvantages the windmill expanded the era of irrigation. It was about the time that the old windmills were clattering themselves to pieces that the importation of the seedless, or what is known as the Washington Navel Orange from Bahia, Brazil, gave an enormous impetus to California fruit in the eastern market. Train loads of winter tourists were beginning to wind their way across the desert from Yuma and Needles.

They studied irrigation and intensive cultivation, and they found that ours was not a land of the lotus, but an empire awaiting the magic alchemistry of soil and water. The limit of gravity irrigation had about been reached, and the whimsical windmill did not appeal to men who were accustomed to see the wheels go around at their bidding, but the gasoline engine came as the answer at the opportune time, when men of means and enterprise were looking for land and seeking opportunity to engage in citrus culture. The gas engine was fairly reliable if an expert engineer stood over it to coax it and to chide it when it balked, but the big ranchmen were glad to pay the great cost of its installation and maintenance. Its life was scarcely seven years, which with the cost of fuel and the salary of the engineer made the expense of operation a heavy burden and a drain on the profits of the industry. Engines of from five horsepower up were installed and streams bearing ten to three hundred and fifty miners' inches were obtained. In spite of their extravagant expense and their smell and their noise these engines did good work in their day and generation, but this is the electric age and before the silent unseen force they vanished to remote places of the earth to keep company with the kerosene lamp.

It was the Southern California Edison Company that ushered in the electric era, by constructing hydroelectric generating plants in the mountains, and carrying the current over high voltage transmission lines to the fields and groves and arid land of Southern California. It gave to the ranchman, orchardist and the gardener a pumping power that is ever ready and efficient, reliable, cheap of installation, requires no personal supervision and costs nothing when it is not actually working. As a result scores of irrigation companies sprang into existence and large Spanish Rancheros were subdivided into small holdings upon which oranges, lemons, deciduous fruits, vegetables and alfalfa are profitably grown.

Practically all of the gasoline engines within the reach of the Southern California Edison Company's lines have been replaced by the silent electric motor and this in less than twelve years.

This is a pumping plant. We enter the building and we are alone. There is no engineer on duty because there is need of none. All is silent save for the swish of the water as the great pump sends it out to mingle with the earth. The great wheels turn as silently as the planets and there is something about the invisible power that is doing its work with strength and quietude that reminds us of the forces that move the universe.

We have talked of the past, and we have seen the present. Before the sun dips into the Pacific, we have yet time to look over into the future. Our way leads up through the San Gorgonio pass to where stretching out before us lies the great drab desert with its hush of death.

Do you see that field off to our left—green with the bright greenness of the shamrock? That is alfalfa under electric irrigation. Did it ever occur to you that alfalfa is milk, butter, cheese and mutton and beef? Plant every arid acre of Southern California to alfalfa, irrigated with electricity, and crop it at each new moon, and send to market in the form of cattle and hogs and sheep and yet the mouths of our hundred million population will call for more pork and mutton and beef.

Look back and see what the setting sun is showing us! A land of homes that nestle among the verdure that irrigation has created.

Now we can view the future—see that line of green where cultivation has crept down to do battle with the sage and the cacti!

Mark it well, and fix your bearings by some mountain peak so that you will remember it. For a few years hence we will come again. Then you will see how the electric motor has advanced its conquest against the sage and the cacti, and what is now a desert "Will blossom as the rose."

ELECTRICAL PUMPING AND IRRIGATION

DISTRIBUTION SYSTEMS.

BY B. A. ETCHEVERRY.

The great majority of irrigation distribution systems consist of open canals or ditches in earth, but there are special conditions and difficulties which have led to a number of smaller irrigation systems, usually under 10,000 acres in extent, built largely or entirely either of wooden flumes, or wooden pipes as in some sections of eastern Washington, southern Idaho, northeast Oregon and British Columbia; or else cement pipe as used for many years in southern California and more recently in the above named states. Some of these conditions are the following:

1. The topography of the country, although not especially rough, is irregular, having no general gradual slope and no well formed ridges. This requires that laterals pass successively from a ridge to a depression making it necessary to use either fluming or pipes for at least a considerable portion of the lateral.

2. The topography is rough and steep which gives steep and irregular grades to the laterals. The high velocity which these grades would give in an open canal would require frequent drops or canal linings. The irregular grades and depressions would have to be crossed by means of pipes or flumes. These conditions may be favorable to pipe or flume systems, for the high grades would permit the use of small size pipes or flumes, which may be more economical than canals. Pipes are usually preferable to flumes for deep depressions requiring high trestles.

3. The volumes of water to be conveyed are small, the water is valuable and the seepage losses must be prevented. The choice is between cement lined canal, flumes, or pipes. These conditions are obtained when the water is valuable because of its scarcity or the high cost of pumping or storage.

Other advantages of pipes over canal or flumes are: (1) they do away with the structures necessary for road crossings over canals; (2) they do not occupy any land which is wasted; (3) they do not collect the dirt and rubbish that fall in open canals.

On the other hand pipes, and to some extent flumes, are only feasible for comparatively small volumes of water and their cost may be prohibitive.

A wooden flume system will consist of main flumes, and lateral flumes, supported on mudsills or on trestles and ranging from the larger sizes down to 10 x 12 in. flumes or smaller. Flume systems become expensive both in first cost and in ultimate cost when the average height of trestles becomes large, and it may be more economical to use pipes.

Pipe systems used for this purpose are wood-banded pipe, vitrified sewer pipe, cement mortar or cement concrete pipe. Wood pipes have the great disadvantage that they are not durable unless kept saturated continuously, but have the advantage that they can be quickly put together. Metal pipes are too expensive and not very durable. Sewer pipe is usually more expensive than cement pipe. Cement pipe is preferable to other materials for low pressures and have been used almost exclusively for the many pipe systems of southern California. Wooden pipes are more commonly used than any other kind for high pressures, but not to exceed 400 ft. The design of wooden pipes has already been discussed. Because of the increasing use of non-reinforced cement pipes for distribution systems where water is valuable and is to be distributed in small volume a rather complete description of this kind of pipe, its properties and method of manufacture is given.

Cement pipe. The cement pipe so extensively used in southern California is made in sections 2 ft. long. One end of the pipe tapers in and the other end tapers out so that when two pipes are joined together they form a bevelled lap joint. This form of joint is preferred to bell joint used for sewer pipes because the outside of the pipe is straight and the pipe is easier to lay; it also requires less material to manufacture. The pipe is made by means of metal moulds in which a moist mixture of cement and sand or cement and gravel is carefully tamped. The mixture is comparatively dry in order that the moulds may be removed to be used again immediately after the tamping is finished. This is necessary to obtain a large output with one set of moulds and as much as 100 ft. a day of 30 in. pipe and 500 to 400 ft. of 6 to 8 in. pipe are made by experienced pipe men with one set. After the pipe is made it is carefully cured by being kept moist for at least one week and allowed to harden. At the end of a month it is ready to be laid and joined in the trench with cement mortar. The sizes commonly used are 6, 8 and 10 in. inside diameter for private distributing lines and 10 to 30 or even 36 and 48 in. for the main lines of the irrigation system. The sizes to use in any case depend on the desired carrying capacity and the grade or fall obtainable.

The cement pipe, as manufactured by this dry process, has not the same strength nor is it as impermeable as a pipe made with a wet concrete and can only be used to cross shallow depressions or where the pressure is moderate. The pressure which it will safely stand depends on the efficiency of the manufacture, the mixture used and the diameter of the pipe. The writer recommends the following values as safe for pipes manufactured with care:

	Maximum pressure head in feet.		
Diameter of pipe in inches.	1 to 2 mixture.	1 to 3 mixture.	1 to 4 mixture.
12	20	15	12
14	20	15	12
16	18	14	10
18	18	14	10
20	16	12	8
24	16	10	6
30	12	8	6

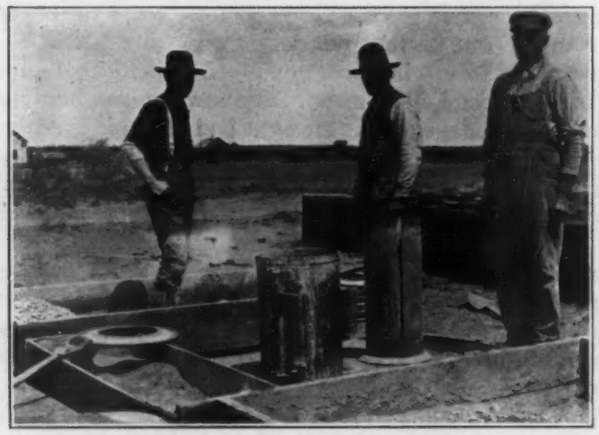
With unusual care, experienced pipe men can make pipe which will stand safely 30 per cent greater heads than those given in the above table.

The use of hand tamped non-reinforced pipe is therefore limited to low pressures and great care must be used in planning and constructing pipe lines in

order that the safe pressures recommended above be not exceeded and all sudden stresses or pulsations which are likely to occur where air is allowed to accumulate in the pipe line must be prevented by providing ample air vents or air inlets at all summits in the pipe line. These air inlets can be formed by cutting a hole in the pipe and cementing to it a vertical stand pipe made of several sections of cement pipes, the lower end of which is cut to saddle around the hole and the upper end extending above the height to which water will rise.

Manufacturing Hand Tamped Cement Pipes.

The mixtures used depend on the material available. With good clean pit gravel containing about 50 to 60 per cent sand, less cement can be used than with sand alone. The mixtures commonly used are 1 part



Moulds for Making Hand Tamped Cement Pipe.

of cement to 4 parts of pit gravel and sand for pipes up to 18 in. in diameter, and 1 part of cement to 3 parts of gravel and sand for larger pipes. If crushed rock or screened gravel is used a good mixture is 1 part of cement to 2 of sand and 3 or 4 of gravel or rock. No gravel or rock larger than one-half the thickness of the pipe should be used. To make the pipe more nearly water tight 5 per cent of the weight of cement in hydrated lime is added. The sand and gravel must be free from dirt or organic matter.

Mixing is usually done by hand and in small batches, but for a large plant concrete mixers are advisable. The materials are mixed by means of a hoe or shovel; they should be mixed three times dry and three times wet. While it is desirable to use as much water as possible, only sufficient water is added to the mixture to give the consistency of damp earth which will retain its shape when squeezed in the hand. When too much water is added the mix will stick to the mould and the pipe will collapse when the mould is removed. In order to make the ends smoother, some manufacturers use for the ends a finer and richer mixture made of 1 part of cement to 2½ or 3 of screened sand.

The moulds consist of a set of base rings which are bevelled to form the base of the pipe, an inside core, an outside jacket, a funnelled sheet iron hopper, a rimmer or cast iron ring which fits around the inside core and bevelled on the inside edge, a tamping bar and a feeding scoop. The pipe is usually made on a solid platform or levelled area. To set the mould in position the inside core is placed inside of the base ring and clamped tight to it by turning a lever, the outside jacket is placed around the base ring and contracted by turning a lever. The hopper fits on the top of the outside jacket. The mortar is fed in the moulds and spread in thin layers one to two inches thick. Each layer must be carefully and uniformly tamped all around the inside core in order that the core be not shifted and the pipe made of unequal thickness. When the last layer has been tamped a little extra material is placed all around the top and the hopper is removed; the rimmer is then placed around the inside core, is jammed down and revolved, at the same time pressing down on the pipe. The inside core is now contracted and removed; the rimmer is taken off. If the pipe has been made on a platform it is now car-

Process of Tamping Mortar in Moulds.

ried by means of lifting hooks with the jacket still clamped on the base ring and placed on level ground. The jacket is now released and removed and the pipe left on the base ring until it has hardened. For large size pipe to avoid lifting and carrying the pipe, the base rings are placed on the levelled ground instead of on the platform.

Where the pipes have to be used for pressures slightly greater than those given and especially for pipes above 18 in. in diameter, it is advantageous to place in the moulds during the tamping process hoops of ordinary wire about 6 in. apart. This permits a slightly wetter mixture and adds strength to the pipe without materially increasing the cost.

Considerable practice is necessary before satisfactory pipe can be made and many pipes will be broken before sufficient experience has been acquired.

Curing the pipe is necessary when the process of moulding is completed. The dry mixture does not contain sufficient water for the cement to crystallize

properly and additional water must be supplied by sprinkling during the curing period. The first sprinkling is done with a fine spray as soon as the pipe has set sufficiently to stand it without washing. After this the pipe must be kept continually moist by frequent sprinkling or by covering with wet burlap or sacks for a period of at least one week and not be allowed to become dry or white.

Coating the pipe to make it less pervious is usually done on the inside with a thin paste of neat cement. Some prefer to use a cement lime mixture made of 2/3 cement and 1/3 lime. The coating of the smaller sizes of pipes, 6 to 12 in. in diameter, is often obtained by dipping the pipe in the liquid. For the larger sizes of pipes the coating is applied with a fiber brush. It is preferable to do this as soon as the pipe will stand the handling, usually when it is 24 hours old, at which time the base rings can be removed. To lift the larger size pipes a lifting jacket which fits around the pipe and tightens when the pipe is lifted, is often used.

The cost of moulds varies. A good mould must be substantially made to withstand the tamping and must be easily and quickly set in position and removed. The largest manufacturer of the moulds used in southern California and supplied to the U. S. Reclamation Service for use on some of its projects is the Kellar and Thomason Company of Los Angeles, California. Their list price in California of a set of moulds for 6 in. pipe with 100 base rings is about $50; for 12 in. pipe with 100 base rings, $82.50; for 18 in. pipe with 50 base rings, $94,25; for 24 in. pipe with 25 base rings, $107.50; and other sizes in proportion.

Dimensions of Cement Pipes and Rate of Manufacturing. Cement Pipe Data.

Inside diameter of pipe in inches.	Thickness of pipe in inches.	Number of feet of pipe made with 1 bbl. cement. 1:4 mixture.	1:3 mixture.	Men composing one crew.	Number of feet made per day.
6	1 1/16	95	75	(1 mixer, 1 or)	400-500
8	1 1/4	63	50	(2 moulders,)	350-400
10	1 3/8	47	37	(1 finisher &)	300-400
12	1 1/2	36	28	(helper)	250-350
14	1 5/8	28	22	(1 or 2 mixers)	225-325
16	1 3/4	23	18	(2 moulders)	200-275
18	1 7/8	19	15	(1 finisher &)	150-225
20	1 7/8	17	14	(helper)	125-175
22	2	15	11 3/4	( )	100-150
24	2 1/4	12 1/4	10 1/2	(3 or 4 mixers)	100-150
26	2 1/4	11 1/2	9	(2 moulders)	90-120
30	2 1/2	9	7	(1 finisher &)	90-110
36	3	6 1/4	5	(helper)	80

Cost of making pipe may be obtained from the above data and the following prices of labor and material: Portland cement, $3.50 delivered on the ground; gravel, $1.00 a cu. yd.; labor, tampers, $3.00 a day, and mixers and sprinklers, $2.50 a day. The figures given include all materials and labor and an allowance of about 10 per cent for interest and depreciation on plant, administration, and supervision, and should not be exceeded with efficient workers.

Cost of Making Cement Pipes (in cents) Per Lineal Foot.

Diameter of pipe.	Cost for 1:2 mixture. (cents)	Cost for 1:3 mixture. (cents)	Cost for 1:4 mixture. (cents)
6 in.	13	10	7
8	15	12	9
10	20	15	11
12	25	20	15
14	30	25	20
16	36	30	25
18	42	35	30
20	50	43	35
24	68	60	50
26	87	75	63
30	95	85	70
36	130	115	95

ELECTRICAL TRANSMISSION FOR PANAMA CANAL.

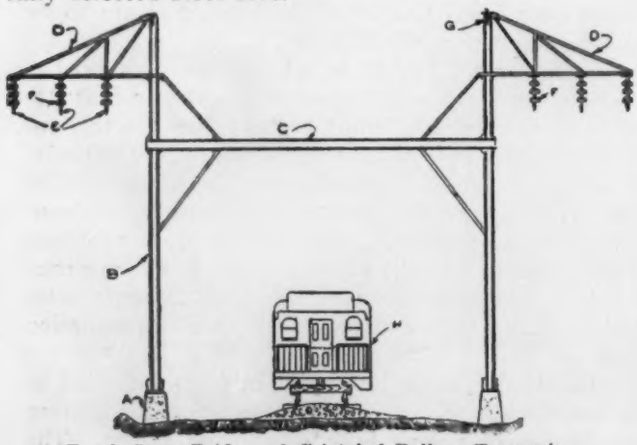
Construction work has been begun upon the permanent electrical transmission line across the Isthmus, according to the Canal Record. The transmission line is fundamentally to transmit electrical energy from a source of generation at Gatun to load centers at Miraflores, Balboa, and Cristobal. The system is simple and straightforward. At the Gatun spillway, a portion of the lake water will be passed through turbines to generate electrical energy. The energy, generated at 2200 volts, 25 cycles, three-phase, will be carried along the east wing of Gatun dam by heavy cables in duplicate underground duct-lines, and through tunnels under the locks, into a transformer substation, situated on the east side of the locks. The duct-lines are in duplicate, to insure maximum safeguard against damage in event of a burn-out of a cable in one or the other of the lines, and are to be laid approximately 600 ft. apart.

At the Gatun substation, which is to be situated at the north end of the hill upon which the present Atlantic Division office building stands, the electric energy will be transformed from 2200 volts to 44,000 volts by means of step-up transformers. The equipment, in addition to three 2000 kilowatt transformers, will consist of the necessary lightning arresters, oil switches, buses, control board, and other auxiliary appurtenances. Two high tension lines will emerge from the substation and tap into duplicate transmission lines.

The transmission line will run from Cristobal to Balboa, completely across the Isthmus, permitting distribution of energy both ways from Gatun. The line is to parallel the right-of-way of the Panama railroad for its entire length. At Cristobal and Balboa will be terminal substations similar to the Gatun substation. The terminal substations will receive the energy at 44,000 volts, less the voltage drop in the line, and step-down transformers will convert the pressure to 2200 volts, which will be the distributing voltage for all circuits. At Miraflores, a substation will be installed for supplying energy for the motors and lamps of Pedro Miguel and Miraflores Locks. If electricity is required along the line, the transmission lines will be tapped by outdoor type of transformer substation equipment. This will probably be done at Caimito, to supply electricity to the high power radio station; at Monte Lirio, to supply power to the bascule bridge, and at any permanent town or military reservation which demands electric lights and power.

At Miraflores, the present steam turbo-generators will be tied into the permanent electrical system through 2200 volt tie-lines extending to the Miraflores substation. This steam station will serve as a reserve in the event the hydroelectric station at Gatun should break down. In emergency, energy from Miraflores will be transmitted back to Gatun and to the terminal substations at Cristobal and Balboa, insuring a continuity of service on the system at all times. The present steam station at Gatun, which has been operated during the construction period, may be abandoned in a year or two if conditions warrant placing entire dependence upon the water power.

The type of transmission line which has been adopted is illustrated in the accompanying sketch. The track-span bridge supports one of the duplicate three-phase lines upon each side of the railroad tracks. Each of the three power conductors is carried from suspension insulators attached to a side bracket. The conductors are No. 00 in size, and are five feet apart and five feet from the frame. The insulators are made of vitreous porcelain, in three units, which is ample to sustain the impressed potential of 44,000 volts. The insulator fittings are made entirely of monel metal to resist climatic corrosion. A ground wire for protection against lightning is carried at the top of each side frame. The ground wire is 5/16 in. copper-clad solid wire. The copper-clad wire is being furnished with a copper sheath of nearly one-half the area of the wire, surrounding an amalgamated, carefully selected steel core.



Track-Span Bridge of Cristobal-Balboa Transmission Line.

The steel bridges are spaced on 300 foot centers, a total of 917 being required across the Isthmus. The span between side frames is 36 ft. The track-span bridge, in addition to supporting the duplicate transmission lines, admits of the suspension of a catenary trolley construction, should it prove desirable in the future to electrify the Panama railroad.

The construction adopted has several advantages for transmission purposes. By paralleling the Panama railroad, material can be brought to within a very few feet of the point of actual erection. The side bracket suspension of the conductors separates the duplicate lines so that a burn-out in one will in no manner affect the other. The conductors are outside the track and will be comparatively free from deterioration caused by smoke from the locomotives. The structure itself is fundamentally strong and is capable of easily resisting all strains introduced by breaks in the wires.

A few details of construction are worthy of note. The No. 00 copper conductors are 7-strand pure copper cables, totaling 1,500,000 ft. in length. The individual strands are manufactured without either a soldered or a welded joint. Splices in the cable will be made with soft copper sleeves. The conductors are suspended at the insulators from monel metal fittings, which are bushed with a copper sleeve. Thus, in the entire length of line, there will be no point where the copper strands are in intimate contact with a second metal; this prevents the introduction of an electric couple and consequent electrolytic deterioration.

At each track-span bridge, the ground wire will be clamped to the tower, and a positive T-connection through a copper wire will be made to ground plates buried in the earth. These ground plates are being manufactured from old scrap copper and cable which have accumulated at the Empire storehouse. By frequently grounding the ground wires, it is expected that line trouble and substation burnouts caused by lightning will be reduced to a minimum. Five hundred thousand feet of copper-clad wire are required for the two ground wires.

The insulators, which will support the conductors, are of two types, suspension and strain, each assembled of three porcelain discs, ten inches in diameter, joined by monel metal fittings. This metal is used on account of its unusual strength and its ability to resist corrosion; galvanized fittings which are customarily used in the United States and abroad are considered practically worthless in the Isthmian humidity. The strain insulator is to be used on sharp curves and for anchoring at intervals, and the suspension insulator is to be used upon tangents and light curves. The suspension insulator swings freely from the bracket, while the strain insulators take the position of the conductors and hold the conductors more rigidly to a line. Each wire requires two strain insulators per bridge on sharp curves, and one suspension insulator is required for each wire per bridge on tangents and light curves. Four thousand suspension insulators and 2500 strain insulators, have been ordered for the entire line. The total weight of the copper conductors, including the ground wires, will be approximately 400 tons.

In the design of the bridge the steel is distributed so as most efficiently to resist the maximum stresses incurred. The side frames are A-frames, to resist uprooting of the bridge in event all wires are down in one span. The crosspiece is made of two channels, which are crossbraced to carry the longitudinal pull of the catenary construction which may be attached if the railroad is electrified. The side brackets for supporting the line conductors are three-legged, designed both to support the weight and to resist the torsional pull of the wires. The brackets and the crosspiece are braced to the side frames, so that the entire bridge acts as a unit to resist side pull on sharp curves.

The type of concrete foundations for the track-span bridges has been given considerable study. The standard foundation will consist of two pedestals under the two legs of each side frame, the pedestals resting upon a spread slab, which latter is reinforced by scrap steel rails. Each leg of the side frame is to be secured to the pedestal through two 15-inch anchor bolts, which are clamped at the lower end to the steel rails in the spread slab. Provision for anchoring the foundations is made by extending downward long reinforcing rods, encased by concrete in a drilled hole, which latter has been sprung at the bottom with light charges of dynamite. This foundation should afford a thorough footing, both for the normal bearing and for anchorage to resist side pull when wires are broken.

ELECTRICAL CONDITIONS AT NAGASAKI, JAPAN.

The new plant of the Nagasaki Electric Light Company was expected to be completed in May and from June 1 would be in a position to furnish current day and night for both light and power. In March the company furnished only current for lighting at night. This company had a very prosperous year and in addition to declaring an 8 per cent dividend for 1912 carried forward net profits amounting to an additional 7 per cent.

The Nagasaki Electric Tramway Company has not as yet been able to finance its enterprise and the promoters have asked for an extension of six months in which to begin the construction work, the time limit for beginning the work having been fixed by charter for February 4, 1913. The principal promoters are Saseho and Kobe men. They have not been able to enlist Nagasaki capital to any great extent and are now trying to finance the scheme in Kobe. The capital required is about $600,000. The two suburban electric lines, one from Nagasaki to Tokitsu and the other from Nagasaki to Mogi, also have not been able to finance their projects and are waiting for the building of the city lines, their lines being intended as extensions or feeders of the city trams.

The electric railway from Sonogi in Nagasaki Prefecture to Azambara in Saga Prefecture via Ureshino and Takeo, both hot springs health resorts, and known as the Hizen Railway Company, is rapidly nearing completion and the section between Sonogi and Takeo is expected to be opened to traffic during the present summer. A cargo of fittings and machinery for this road came from the United States last spring.

The Kagoshima Electric Tramway (city) was opened to traffic December 1, 1912, and is in successful operation. The machinery is of American make.

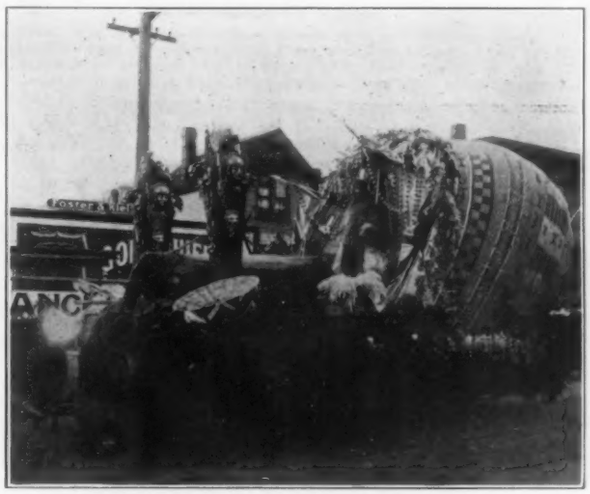
The hydroelectric power station at Chijiwa, owned by the municipality of Chijiwa, in Nagasaki Prefecture, has been in very successful operation, and the plant will have to be enlarged to supply the demand for electric light on Shimabara Peninsula.

The large power station of the Kiushu Hydroelectric Company at Hita on the upper reaches of the Chikugo River in northern Kiushu is now in course of construction and is expected to be in operation by October 1, 1913. This plant will be capable of developing 20,000 horsepower and the promoters expect to transmit power to Moji, Kokura, and Wakamatsu on the Straits of Shimonoseki.

The Shimabara Light Steam Railway, in Nagasaki Prefecture, was very successful in 1912, and the extension of the line is being pushed rapidly. The second section of the road between Aino and Kojiro, a distance of 8 miles, was opened to traffic October 4, 1912, and it was expected that the section from Kojiro to the town of Shimabara would be opened to traffic about June 1, 1913. This road when completed will afford one of the most picturesque trips in this part of Japan, traversing a very fine rice country, skirting the coast of Shimabara Gulf, and running along the foot of Unzen Mountain, an extinct volcano rising from the waters of Shimabara Gulf. A large Japanese-style hotel is now building at the Shimabara terminus of the road to accommodate the expected Japanese tourist travel to the mountain, which is famous for its hot springs and scenic attractions.

SEATTLE'S ELECTRICAL PAGEANT.

One of the most brilliant Electrical Pageants held on the Pacific Coast was given by the Tilikums of Elttaes on the evenings of July 16th and 19th to celebrate the opening and closing of the Potlatch Carnival at Seattle, Washington. There were fourteen floats in the pageant, representing Comet, Hyas Tyee, The Eagle, Grotto, Submarine, Tilikums, Drill Team, Shasta Daisies, Indian Canoe, Summer Float, Flying Birds in Cloudland, Wild Demon, Bear, Gold Bug and Indian Basket, a picture of which is shown, as indicating the elaborateness of the display.



Floats—Indian Basket, Typifying Indian Life.

Accompanying the floats were many Tilikums costumed as bears, eagles, frogs, ravens, different bugs and Indians. The first drill team wore hats illuminated with six lamps each, and executed many fancy maneuverings. The second drill team headed a body of three hundred marching Tilikums, each wearing above his hat an electrically illuminated swinging lantern with a Potlatch Bug on each side.

It is estimated that 200,000 people viewed this parade on the first night, and much praise was heard on all sides for the enthusiastic spirit shown by the Tilikums in presenting so gorgeous a spectacle. The name "Tilikums of Elttaes" is the Indian phraseology for "Friends of Seattle" and that body now has upon its roll the names of twenty-seven hundred members. The electrical pageant cost over $10,000 in actual expenditures in addition to the large amount of work gladly given by the members of the Tilikum Lodge in its preparation. The floats were designed by Miss E. L. Mulkey; and the electrical features and general supervision of the work was under H. Joslyn, chairman of the Pageant Committee.

JOURNAL OF ELECTRICITY
POWER AND GAS

PUBLISHED WEEKLY BY THE

Technical Publishing Company

Rialto Building, San Francisco

E. B. STRONG, President and General Manager
A. H. HALLORAN, V. P. and Managing Editor
ROBERT SIBLEY, Treasurer and Editor in Chief
C. L. CORY, Secretary and Special Contributor
A. M. HUNT, Director and Special Contributor

On Library Cars of all Southern Pacific Trains.

TERMS OF SUBSCRIPTION

United States, Cuba and Mexico	per year,	$2.50
Dominion of Canada	" "	3.50
Other Foreign Countries within the Postal Union	" "	5.00
Single Copies, Current Month	each	.25

NOTICE TO ADVERTISERS.

Changes of advertising copy should reach this office ten days in advance of date of issue. New advertisements will be accepted up to noon of Monday dated Saturday of the same week. Where proof is to be returned for approval, Eastern advrtisers should mail copy at least thirty days in advance of date of issue.

Entered as second-class matter at the San Francisco Post Office as "The Electrical Journal," July, 1895.

Entry changed to "The Journal of Electricity," September, 1895.

Entry changed to "The Journal of Electricity, Power and Gas," August 15, 1890.

Entry changed May 1. 1906, to "The Journal of Electricity, Power and Gas," Weekly.

FOUNDED 1887 AS THE
PACIFIC LUMBERMAN, CONTRACTOR AND ELECTRICIAN

CONTENTS

The Y. M. C. A. as a Local Technical School 103
By W. Haynes.

Hydraulics I. 105
By Otto B. Goldman.

Electricity and the Architect 106
By Frank E. Wallis.

Electric Irrigation, or the Motor's Conquest of the Desert.... 107
By W. L. Frost.

Distribution Systems 109
By B. A. Etcheverry.

Electrical Transmission for Panama Canal..... 111

Electrical Conditions at Nagasaki, Japan 113

Seattle's Electrical Pageant 113

Editorial 114
Creating New Business.
Discord Among the Contractors.
A Defense of Science.

Personals 116

Meeting Notices 117

News of Oregon Railroad Commission 117

News of California Railroad Commission 117

New Catalogues 117

News of Electrical Contractors 118

Industrial 120
Small Motor-Driven Refrigerating Plant.
Automatically Switching Apparatus to Auxiliary Supply Mains.
The Wire Industry.

Trade Notes 121

News Notes 122

Creating New Business

The fact is being continually more forcibly impressed upon the minds of business men in the electrical industry that success is to be gained not so much by alertness in competition or by the power of monopoly as by the actual creation of an increased demand for electrical apparatus. For a company to merely serve existing consumers is not sufficient. Electrical merchandizing, excepting the product of the central station, differs from most other kinds of business, in that there is little or no "comeback." Most of the generating apparatus, as well as the transmission and distribution equipment, has a depreciation of less than ten per cent. An electrical contractor can look for little new work in a building which was adequately wired when erected. Electrical devices for industrial and domestic use, with the exception of lamps, have long life and are seldom renewed. Electrical supplies in general are not consumed as are food and clothing. More business must be new business. The electrical industry can continue only by expansion.

In the past the natural growth has been phenomenal and has severely taxed the capacity of all manufacturers to meet the regular demands. Today the electrical industry represents an investment of ten billion dollars. The central station industry alone, is doubling its earnings and investments every five years, growing twice as fast as the country itself. Some of the Pacific Coast companies are annually earning better than twenty dollars per capita. Yet the business has not kept pace with the possibilities which have been opened up by science, nor has the efficiency of selling been fully developed.

To still further accelerate this rapid growth a concerted, aggressive effort of co-operatiive endeavor is being launched by the Society for Electrical Development. Positive methods are to be employed in getting every man, woman and child in the country to "do it electrically," a habit which, once formed, should never be broken. The people are to be taught by general educational publicity how indispensable electricity is in every walk of life. As such a co-operative campaign has already proved most effective in creating and extending the sale of electric lamps, as well as of electric vehicles, its success seems assured if proper support is received from individual electric companies.

A Defense of Pure Science

Pure science, long scorned alike by business man and classical student, has finally come to its own through the marvellous results attained in the research laboratory. The man of money admits the inadequacy of "the rule of thumb" and the man of letters confesses the inability of "the humanities" to accomplish for human service what has been done by science. Working for the sheer love of it, without thought of reward, the scientist is making possible a bigger business and a finer literature than the world has yet known.

Business will be dependent upon science for much of its future development. Many a profitable indus-

try has been, and is yet to be founded upon science for science' sake. The dye works of Germany, the electro-chemical plants of Niagara, the nitrate factories of Norway, are but the forerunners of a substantial prosperity to be reared upon the stable basis of scientific investigation. In order that these beneficial results may be the more speedily accomplished business men and governments are endowing research laboratories, realizing that such investments will compound themselves many times.

Literature, also, must yield to science its claim as the supreme product of constructive imagination, the greatest of human powers. The scientific imagination of the nineteenth century was more productive in human advancement than all the literary imagination of the preceding eighteen. A mere language, such as Greek or Latin, has no inherent value as a humanity beyond its power as a vehicle to convey inspiring thoughts. Writing is great in proportion to the greatness of its theme. Literature is classed as a humanity because it chronicles great deeds. Is not the conquest of nature more worthy of record than the conquest of a nation? Is not the constructive imagination which conceived the subjugation of the untamed energies of the mountain torrent by trestled flume and impulse wheel greater than that which put a barbaric race under the yoke? The instantaneous delivery of electric power to distant cities, the wireless transmission of thought across pathless seas, surpass the most extravagant dreams of the ancient writers. Newton, Faraday and Maxwell were greater humanists than Alexander, Caesar and Napoleon. A mathematical formula may involve a higher degree of constructive imagination than a poem. The brilliant discoveries as well as the patient labors of the men of genius who have developed modern science are as great in their inspiration for prose or poetry as the deeds of valiant warriors or intriguing courtiers.

Woodrow Wilson has said "character is a by-product, it comes, whether you will or not, as a consequence of a life devoted to the nearest duty." Thus it is that the scientist as a man of the highest character is worthy of visualization by the most able writers. Furthermore, art is so deeply indebted to the scientist for such instruments as the camera and the phonograph, which have so extended her influence and life by forever fixing the deleble, that the obligation can be repaid only by recognition.

Discord Among the Contractors

Notwitstanding the spirit of co-operation which pervades the several branches of the electrical business there still remains a lack of harmony between the individual members of some of the branches. Particularly is this true among the Pacific Coast electrical contractors. Destructive competition at Seattle and Los Angeles, a factional strike at Portland and the formation of a new association at San Francisco are only the external evidences of an underlying spirit of unrest. While it is better for bodily impurities to break out as boils than to remain as active poisons in the blood, their appearance is indicative of a condition which needs correction.

Destructive competition in any community can be eliminated only by a slow process of education, such as that which has been undertaken by the Jovian Order. The factional fight at Portland is a reflex of the labor trouble between the Pacific Gas & Electric Company and its employees, such strikes can be obviated only by public insistence that these controversies be submitted for mediation to an unprejudiced tribunal. The new association was originally formed at San Francisco as a protest against the municipal ordinance regulating electrical construction. A possible adjustment requires more extended study.

It is claimed by nearly a hundred master electricians that San Francisco's new electrical ordinance is discriminatory in character. Without entering into a discussion of the merits of the two sides in this controversy it must be admitted that the idea of a special code for each city is fundamentally wrong when a National Code has been provided. When this is found lacking it seems better to correct it than to draw up a new code for each city with its attendant dangers of cheap work.

Investigation will show that many of the faults which the local regulations are intended to correct are due not to the code but to attempted evasions thereof. What with the restriction of rigid specifications and close competition in bidding the average contractor stands between the devil and the deep sea. It is notorious that the profits in the business come from the extras. It is unfortunate that the losses are sometimes covered by careless installation. Too low a bid brings loss not only to the bidder but also to the trade at large by lowering both prices and standards. The contractors are at fault in having accustomed the public to expect unduly low competitive bids and it has become one of the prime objects of the various associations to educate members on the subject of correct bidding principles.

Such associations in no way represent restraint of trade, but are intended to teach that prices quoted and work delivered are one and the same. Business reputation can be built only upon honest installation. These are the objects for which the old association was founded. Many contractors, particularly the larger concerns, have benefitted thereby. But there still remained a greater number, especially among the smaller contractors, who were not organized. These constitute the bulk of the new association. While there may be a few points of policy upon which the two associations differ their main interests are identical. The new association can do a great work in interesting its members in better trade conditions and eventually a coalition of the two may be accomplished, when their minor differences are bridged over and their combined energies directed to upbuilding the business.

Concession must precede co-operation. Before the two associations can be brought together mutual prejudices must be removed and each side must concede some disputed question. A thunder storm is the result of a difference of potential between two clouds; the new association is the result of a difference of opinion between two classes. After the storm has passed the atmosphere will be clearer, and if nobody gets in the way there will be no fatalities from lightning. The parched soil will be moistened and new verdure will spring up. Let there be harmony.

PERSONALS

ITEMS FOR THIS DEPARTMENT ARE SOLICITED FROM ALL READERS

I. W. Anderson, president of the Oregon-Washington Corporation, Portland, was in Seattle last week.

O. W. Lacey, of the H. C. Lacey Company, Hanford, was a visitor in San Francisco the first part of the week.

H. H. Anderson, salesman Seattle office Pacific States Electric Company, is spending his vacation at Calgary, Alta.

H. L. Bleecker, a vice-president of the Washington Water Power Company, has returned to Spokane, Wash., from California.

F. H. Leggett, manager of the Western Electric Company, San Francisco, left this week for a several days' trip to Los Angeles and the south.

O. L. Cowart, salesman for the General Electric Company in the Alaska territory, has returned to Alaska after a short business trip to Seattle.

W. E. Ayden, assistant treasurer, Seattle office Pacific States Electric Company, is spending his vacation at Lake Crescent, Washington.

Geo. Campbell, general manager of the Truckee River General Electric Company, Truckee, Cal., spent the first part of the week in San Francisco.

P. H. Affolter, chief electrical engineer Fairbank, Morse Company's San Francisco office, was in Eureka this week on business for the company.

H. S. Jones, motor salesman Allis-Chalmers Manufacturing Company's San Francisco office, returned this week from a pleasant vacation at Lake Independence.

W. D. Ludwig, formerly treasurer of the Tacoma Electric Machinery Company, has succeeded J. W. Holmes as manager, Mr. Holmes retiring from the business.

A. E. Drendell, president of the Drendell Electric & Manufacturing Company of San Francisco, is enjoying a month's hunting trip in the big redwoods of California.

L. S. Nicholson, sales manager Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., is making a trip through the northwest in the interest of his company.

D. I. Gallivan, San Francisco manager of the Newbery Bendheim Electric Company, has left for a three weeks' vacation and hunting trip through Mendocino county, Cal.

F. L. Webster, manager San Francisco branch Allis-Chalmers Manufacturing Company, spent several days in the northern part of the state this week in the interests of the company.

J. A. Reardan, of the Reardan Electric Company, Seattle, is making a business trip to San Francisco and upon his return will go to Vancouver and Victoria, B. C., on a similar mission.

A. A. Miller, manager railway and lighting division, Seattle office, Westinghouse Electric & Manufacturing Company, has returned from a ten-day business trip through eastern Washington, and western Montana.

J. L. Casey, purchasing agent, Seattle office Pacific States Electric Company, was married July 28 to Miss Lillian Knowles of Seattle. Mr. Casey was the recipient of a handsome silver dinner set by the other employes.

Henry Kammerer, electrical engineer for the American-Hawaiian Sugar Company at Crockett, who is also superintending the electric street decorations for the coming Native Sons' celebration, was in San Francisco during the week.

Col. Geo. W. Goethals, chairman of the Isthmian Canal Commission and chief engineer of the Panama Canal, has accepted the honorary presidency of the International Engineering Congress and will preside in person over the general sessions to be held in San Francisco, Sept. 20-25, 1915.

H. S. Graves, Chief United States Forester, was at San Francisco this week en route to Washington, D. C. Mr. Graves spent several weeks in the Pacific Northwest and reports that the present policy of the Forestry Bureau will undoubtedly aid the development of our great natural resources.

Dr. Thos. Addison, of the General Electric Company, San Francisco, has called a meeting of the local office managers and general officials of the Pacific Coast district for Del Monte, August 1 and 2. Among those in attendance will be T. E. Bibbins, S. E. Kearney, W. J. Davis, J. A. Cranston, R. J. Cash.

W. L. R. Emmett, engineer in the turbine department of the General Electric Company, Schenectady, arrived in San Francisco, and expects to make an indefinite stay on the coast. He will be present at the trial trips of the U. S. collier Jupiter, having designed the turbo-electric propulsion installation of that vessel.

F. E. Pernot, at present connected with the experimental department of the Pacific Telephone & Telegraph Company, has been elected an instructor in electrical engineering at the University of California. Mr. Pernot took the degree of Master of Science from California last year. He is now actively engaged in the inductive interference tests being conducted by the power and telephone companies in this state, and will take up his new work next month.

Artuhr P. Davis, chief engineer for the U. S. Reclamation Service, has returned to California from a trip to Alaska made for F. G. Baum & Company, who are consulting engineers for the Alaska Gastineau Mining Company in the construction of a concrete dam of the Jorgensen variable radius arch type. The height of the dam is to be 168 ft. with a maximum thickness of 47.5 ft., the total yardage being about 50,000. Work on the dam and power project is progressing rapidly.

Prof. Michael J. Golden, for thirty years the head of the Practical Mechanics Department of Purdue University, Lafayette, Indiana, is at San Francisco visiting his sister Dr. A. W. Bidding, who is connected with the food laboratory of the United States Department of Agriculture. Prof. Goldens' faithful service at Purdue has won him many friends, and those in California are welcoming him on his first visit to the Coast. He will attend the Bohemian "Jinks" to be held soon in Bohemian Grove.

John G. Williams has been appointed assistant superintendent of street railway service of the Utah Light & Railway Company, to fill the vacancy occasioned by the promotion of George W. Manning into the superintendency. Mr. Williams is an old time street railway man and began his service in Salt Lake City as motorman on the Murray line of the old Rapid Transit Company, under Mr. Cameron. His long service with the company and experience in handling the public admirably fit him for the position.

H. T. Cory, consulting engineer, San Francisco, who returned last week from an extensive trip in the East, has been highly honored by having presented to him the Fuertes gold medal from Cornell University. This medal was founded by the late Prof. E. A. Fuertes, for many years Dean of the College of Civil Engineering at Cornell, and is awarded each year to an alumnus of Cornell for meritorious research work. Mr. Cory, who received the degree of M. C. E. from Cornell in 1893, received the medal on account of research work done in hydraulics.

Julian Bamberger, vice-president of the Salt Lake & Ogden Railway Company, has returned home from a seven weeks' trip east, during which time he made a thorough study of the development of interurban lines centering about Philadelphia, New York, Buffalo, Cleveland, Detroit, and Chicago. Mr. Bamberger spent most of his time in the shops of the big interurban systems with a view of keeping things

up-to-date in their Salt Lake shops. He also investigated the terminal arrangements of eastern routes with a view of developing their city terminal proposition in Salt Lake City. While away he attended the convention of the master car builders and master mechanics at Atlantic City.

MEETING NOTICES.

Electrical Development League of Alameda County.

The regular monthly meeting of the Electrical Development League of Alameda county was held at the Hotel Oakland, Oakland, July 26th. A general discussion was held on Signs, Windows and Street Lighting as well as the general procedure of the City Electrical Department. J. H. Vandegrift, presided, having recently returned from an Eastern trip.

Oregon Society of Engineers.

The following permanent committees have been appointed by the president: Legislative Committee: E. H. McAlister, L. F. Harzaa, J. A. Fouilhaux, J. H. Morton and M. F. Harrison. Public Relations Committee: Robt. G. Dieck, chairman, other members to be appointed by chairman; Greater Portland Plans Committee: Wm. S. Turner, Charles F. Fisher and Hudson B. Hastings. Higher Curricula Committee: D. C. Henny, J. C. Streng and Henry Blood.

ILLUMINATING ENGINEERING SOCIETY CONVENTION.

The annual convention of the Illuminating Engineering Society will be held in Pittsburgh, September 22d to 26th. The papers committee advises the following papers have been secured: "The Use of the Photo-Electrical Cell in Photometry," by Prof. T. R. Richtmeyer of the Department of Physics, Cornell University; "Characteristics of Enclosing Glassware," by V. R. Lansingh; "The Quartz Mercury Vapor Lamp and Its Applications," by W. A. D. Evans of the Cooper Hewitt Electric Company; "The Fontune Lamp as a Working Standard," by Messrs. E. G. Crittenden and A. H. Taylor of the Bureau or Standards, Washington, D. C.; "The Neon Tube Lamp," by M. Georges Claude of Boulogne, France. In addition to these, Mr. Roscoe Scott of the Nelite Works of the General Electric Company, Cleveland, Ohio, will deliver a lecture on the "Evolution of Illuminants."

ELECTRIC PARADE TO HONOR WIZARD OF THE WASATCH.

The Wards of the Wizard of the Wasatch, Salt Lake City, Utah, are planning a spectacular electrical parade for the evening of August 31st, which is the final day of the celebration in honor of the visit of the Wizard of the Wasatch — a carnival which it is planned to hold annually to typify the progress of the state in its agricultural, mining, industrial and social activities. The Utah Light & Railway Company have proffered the use of their Second East Street car barn now vacant, and Don J. Eaton who has been appointed Superintendent of Construction, is now busily engaged in the preparation of the floats, the designs for which have been chosen.

NEWS OF OREGON RAILROAD COMMISSION.

The commission has served notice on the various public utilities located within the state to appear before the commission at Salem, Ore., on August 12thr, and defend their practices of constructing telegraph, telephone, signal, trolley and power lines within the state with the object of determining whether the practices of these utilities are just, reasonable and safe.

The commission in its decision of the case of the Home Independent Telephone Company against the Eastern Oregon Co-operative Telephone Company, found that the rates of the independent company are insufficient to provide for the upkeep of the plant, or to pay fixed charges, and fixed new rates, such as are held to be necessary for continued operation of the plant. This establishes the principle that "cut-throat" competition will not be permitted to such extent that one company will be permitted to fix rates lower than are necessary for operation. Two other important principles were announced in relation to the practices of public utilities, recently brought under the jurisdiction of the railroad commission. One is that stockholders cannot be allowed preferential rates and the other ruling is that patrons owning facilities may be paid a reasonable rental for the equipment they own, though they may not be allowed special rates or rebates. The new rates established are $2.50 per month, individual service, business; $2 for party lines, business; $1.75 for individual service, residence; $1.25 for party lines, residence; this rental to include privilege of free use of all the company's lines in Union county for conversations limited to four minutes, to all subscribers, if the company so elects.

NEWS OF CALIFORNIA RAILROAD COMMISSION.

Santa Barbara Gas & Electric Company has been given authority to issue bonds in the sum of $100,000, to be used for making extensions to the company's gas plant in the city of Santa Barbara.

The commission has rendered a decision denying the application of the San Diego Consolidated Gas & Electric Company to issue 3148 shares of its common capital stock of the par value of $314,800. The corporation applied for authority to issue the stock to pay the discount upon its bonds issued since March, 1909.

The Home Telephone Company of Covina has applied to the commission for authority to issue $40,000 of bonds, and to use the proceeds for building an exchange at Puente and for extending and enlarging its system in the localities in which it operates.

The Citrus Belt Gas Company, San Bernardino, has applied to the commission asking that it extend the effective date of its recent order authorizing the issue of stock and bonds for a period of 12 months.

The Saratoga Telephone Company and the Pacific Telephone & Telegraph Company have applied for an order authorizing the latter to purchase the property of the former for $3000.

Authority has been granted to the Pacific Telephone & Telegraph Company to withdraw from territory in and about Compton. The Consolidated Utilities Company to withdraw its telephone service, also is authorized from the territory in and adjacent to Watts station, Los Angeles county. The commission authorizes the companies to enter into an agreement under which telephone service will be provided for the communities concerned.

NEW CATALOGUES.

Catalogue No. 28 from the Hemingray Glass Company illustrates and describes their line of Standard Glass Insulators in a most attractive manner. A phantom half-tone and a line drawing of each style of insulator is shown, together with specifications as to weight and package quantity. Several illustrations of high voltage tests are also shown.

The General Electric Company has issued Bulletin No. A4123, describing Automatic Voltage Regulators for the regulation of generator voltage. Bulletin No. A4127 describes a Straight and Automatic Air Brake Equipment for use on either single cars or trains of three or more. Cars provided with this equipment may be used as locomotives for switching service, and for operating interchangeably with steam railroad cars. Bulletin No. A4121 is a revision of the company's bulletin on Direct Current Motors of the commutating pole design.

THE ELECTRICAL CONTRACTORS' DEPARTMENT

NEW ELECTRICAL ORDINANCE FOR SAN FRANCISCO.

(Continued.)

Sec. M. All electrical wires hereafter installed in or on all dwellings and flats as the same are now or may hereafter be defined in the building law of the city and county of San Francisco, shall be installed by means of porcelain knobs and bushings, except main service wires, which must be installed and enclosed in rigid iron conduits, provided however, nothing in this section shall be so construed as conduits or other armor, excepting that approved cutouts or in any way preventing the enclosing of all wires in iron fuses must be provided where such wires enter or leave buildings.

Sec. N. Nothing in the ordinance shall be so construed as in any way to regulate the installation of any wires, appliances, construction or equipment of any telephone, telegraph, district messenger, call bell systems, or the connecting or disconnecting of any current measuring device, and the same are hereby exempted from any of the foregoing provisions.

Sec. O. Every corporation, co-partnership, association, or individual, or agent thereof, placing or installing electrical wires, appliances, apparatus, construction or equipment in, on or about any building, or other structure, in the city and county of San Francisco, shall, before a certificate of inspection, as provided for in Section S of this Ordinance, is issued by the department of electricity for the said city and county, pay to the department of electricity for such inspection the following fees, viz:

For each outlet at which current is controlled or issued for four lights or under	$0.05
For each outlet at which current is controlled or is used for over four lights	0.10
For one arc lamp	0.50
For each additional arc lamp	0.25
For each motor of 1 horsepower or less	0.50
For each motor of more than 1 horsepower and not more than 3 horsepower	1.00
For each motor of more than 3 horsepower and not more than 8 horsepower	1.50
For each motor of more than 8 horsepower and not more than 15 horsepower	2.00
For each generator of 1 kilowatt or less	0.50
For each motor or more than 15 horsepower	2.50
For each generator of more than 1 kilowatt and not more than 3 kilowatts	1.00
For each generator of more than 3 kilowatts and not more than 8 kilowatts	1.50
For each generator of more than 8 kilowatts and not more than 15 kilowatts	2.00
For each generator of more than 15 kilowatts	2.50

Provided, however, as a minimum, the total amount of any bill of fees to be charged shall not be less than fifty (50) cents.

Sec. P. When any corporation, co-partnership, association or individual, or agent thereof, after notice has been given in writing by the chief of the department of electricity, shall be found to have intentionally or negligently violated any of the rules or regulations, established under this ordinance; or when, through any such violation, by corporation, co-partnership, association or individual, or agent thereof, doing the work, it is necessary to make extra inspection of the work, there shall be charged said corporation, co-partnership, association or individual, or agent thereof, for such extra inspection made necessary on account of such violation a fee of not to exceed seventy-five (75) cents per hour for the time actually consumed by each inspector making such inspection, and for the inspection of electrical wires, appliances, apparatus, construction or equipment, for which no fee is herein prescribed, and for the inspection of temporary installation for decorative advertising, theatrical or similar purposes there shall be charged to and paid by the corporation, co-partnership, association or individual, or agent thereof, installing such work, a fee not exceeding seventy-five (75) cents per hour for the time actually consumed by each inspector making such inspection, previous to obtaining the necessary certificate of inspection as aforesaid.

Section Q. It shall be the duty of the chief of the department of Electricity to turn all moneys received under this ordinance into the treasury of the city and county of San Francisco.

Sec. R. This ordinance shall not be construed to relieve from or lessen the responsibility of any person owning, operating on installing any electrical wires, appliances, apparatus, construction or equipment for damages to any one injured by any defect therein nor shall the city and county, or any agent thereof, be held as assuming any such liability by reason of the inspection authorized herein or the certificate of inspection issued by the department of electricity.

Section S. Upon completion of the wiring of any building it shall be the duty of the corporation, co-partnership or individual doing the same to notify the chief of the department of electricity, who shall at once inspect the same, and if approved by him shall issue a certificate of satisfactory inspection, which shall contain the date of such inspection and an outline of such examination; nor shall current be turned on such installation until said certificate or extension be issued; or shall any change, alteration or extension be made in the wiring of the building after inspection without notifying the said chief and securing a permit thereof.

Sec. T. Any person, firm, company or corporation that violated, disobeys, omits, neglects or refuses to comply with, or that resists or opposes the execution of any of the provisions of this ordinance, shall be guilty of a misdemeanor and upon conviction thereof shall be punished by a fine not exceeding five hundred (500) dollars, or by imprisonment for not more than six (6) days or by both such fine and imprisonment; and every person, firm, company or corporation can be deemed guilty of a separate offense for every day such violation, disobedience, omission, neglect or refusal shall continue, and shall be subject to the penalty imposed by the section for each and every separate offense.

Sec. U. The following sections of ordinance No. 1008 are hereby repealed: Section 270, Section 271, Section 272, Section 273. Section 274, Section 275, Section 276, Section 277.

Sec. V. This ordinance shall take effect and be in force from and after passage.

N. B.—This ordinance is not to be made effective until January 1, 1914, because of certain objections raised since it was passed.

(Concluded.)

PORTLAND ELECTRIC ORDINANCE.

The electric sign ordinance of Portland, Oregon, has been amended to allow "lens signs" to be installed. Also the license cost is to be based upon a charge of 10 cents per square foot for all electric signs suspended over the sidewalks of the city.

NEWS OF ELECTRICAL CONTRACTORS.

The W. H. Smith Electric Engineering Company is installing the electrical equipment in the Elks theater, in Roseburg, Oregon.

The Gamewell Fire Alarm Telegraph Company, Seattle branch, has a contract to install a 10-box fire alarm system for the city af Nanaimo, B. C.

The Pacific Coast Electric Company has obtained the electrical contract for the new Turnverein Hall, Twelfth and Main streets, Portland, Oregon.

S. W. Bailey & Company, Seattle, have just completed installation of electrical equipment in the new three-story home of the Volunteers of America near Ravenna Park.

Herbert C. Moss, illuminating engineer, Seattle, has revised the electrical plans for the Seattle branch of the Ford Manufacturing Company plant. Bids are now being received on same.

C. H. E. Williams, electrical engineer and contractor, Seattle, is installing the electrical equipment in the four-story warehouse of Sylvester Brothers at Fourth South and Vermont streets.

The Pacific Fire Extinguisher Company, Portland, has obtained the electrical contract for the new factory being built by the Ford Motor Car Company at Division and East Eleventh streets.

The electrical contract for the new apartment house belonging to Dr. W. L. Wood, located on the northwest corner of Tenth and Hall streets, Portland, has been awarded to the C. K. Claggett Electric Company.

The Salt Lake City Fire Department is installing 105 new Gamewell keyless fire alarm boxes to take the place of the old key boxes which have caused so much inconvenience. Forty of these boxes will be in the business district.

The Monarch Oil Company, San Francisco, has recently abandoned its isolated plant in favor of central station service. A complete change of equipment from direct to alternating current was made. All installations were made by the Mechanical Installation Company.

The Decker Electrical Construction Company, San Francisco, has been awarded the electrical contract for the Marine Hospital for approximately $3000. The electrical contract for the Hotel St. Francis Annex, San Francisco, has been awarded to Harry S. Tittle, electrical contractor, at a price of $12,545.

The Hill Hydraulic Machinery Company, Seattle, recently installed a 12-inch ram for Fred R. Hawn, near Grandview, Washington, pumping 110 feet above the canal. This is the second unit installed for irrigating 200 acres of land. The company has also furnished Contractor C. D. Walter for installation at North Prosser, Washington, a 9-inch ram with a 60 foot lift.

The Mechanical Installation Company, San Francisco, has recently installed at Crystal Springs for the Spring Valley Water Company, a 400 h.p. and two 500 h.p. General Electric motors, the latter being connected to a Byron Jackson pump, which delivers 12,000,000 to 15,000,000 g.p.d. against a 125 ft. head. An 800 h.p. Crocker-Wheeler motor has been installed for the same company at Ravenswood, Cal.

The Issaquah & Superior Coal Mining Company Ltd., with offices at Seattle and mines in King county, has closed a contract with W. R. Hendry & Company, Seattle, for the complete installation of electrical equipment at its mines. By reason of the equipment the capacity of the mines will be increased from 200 tons to 3000 tons per day. The aggregate h.p. of the new equipment will be about 1000.

Colman & Hahn, electrical contractors and engineers, Tacoma, have been awarded the contract for installing the equipment in the Buffelen Lumber Manufacturing plant. There will be one 300 kw. engine and generator outfit, one 4-valve automatic Buckeye engine, 29 motors and other machinery to be used in connection with wood working machinery for planing mill service.

THE OUT-OF-TOWN CONTRACTOR.

Mr. T. H. Nelms of the Pacific States Electric Company, San Francisco, had occasion to visit an out of town contractor who desired assistance preparing his store during a carnival week.

The results were so favorable both the contractor and the jobber that it is sufficient evidence the effort was worth while.

Mr. Nelms' report is submitted herewith:

"I have frequently noticed that the small town merchants do not keep their stores in an up-to-date manner. The stock is not attractively displayed and the store is often dirty and in disorder. At night the windows are not lighted. This last, to me, is the most serious fault, as window lighting is the cheapest and most effective advertising. The merchant argues that window lighting is useless as there is no one on the street at night to view his display—forgetting that were his windows, as well as those of his neighbors, lighted, there would be something for the people to come out to see.

"A short time since I had occasion to visit an electric contracting establishment in a nearby town, my mission being to assist in preparing the store and windows for a fete week. I found the above mentioned conditions more or less in evidence in this store. Starting on the outside we hung an arc in front of the store. We needed rugs, furniture and silverware, etc., to dress the place in gala attire and with the standing the customer had in the town, I found no trouble in accumulating these articles.

"With a little thought and some hard work the store was soon transformed, and during the week it attracted more than its share of attention. This cannot help but bring business to the firm.

"It would seem a good idea to educate our out of town customers to keep their stores attractive and up-to-date—showing them that articles effectively displayed means more business. It costs no more to keep a store in this manner, all that is needed is a little work.

Such effort is work along the highest, broadest lines of publicity and advertising. Carried out not only in the electrical field but by merchants in all lines of business, working together, whether in a city or rural community, redounds to the ultimate benefit not only of the manufacturer, jobber, retailer but the community at large and the individual citizen.

BOOK REVIEW.

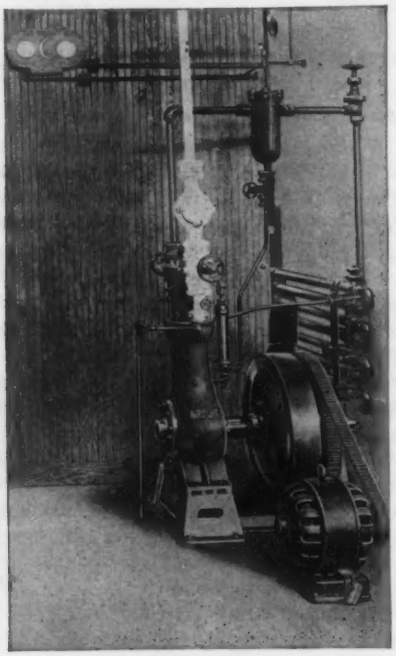
Excavating Machinery. By A. B. McDaniel; 340 pp., 6x9; 134 illustrations. Published by McGraw, Hill Book Co., and for sale by Technical Publishing Co. Price $3.00.

In this text a trained observer has brought into compact form the whole subject of machine digging devices so that the engineer and contractor as well as the farmer, landowner, or public official can determine which kind of excavator is best adapted to his needs. The work is divided into two sections, scrapers, graders and shovels occupying 100 pages, and dredges and trench excavators the balance. The arrangement of text is logical, the descriptions of machines and methods clear, the selection of cost data, judicious and the citations of practice wide in scope. A carefully compiled bibliography gives to the investigator additional sources of information if desired.

INDUSTRIAL

SMALL MOTOR DRIVEN REFRIGERATING PLANTS.

The small motor driven refrigerating plant, of which a typical example is shown in the illustration, is being used more extensively every day. Like the vacuum cleaner and the artificial ventilating system, it provides a modern and efficient means for producing results that are necessary for health and comfort.



Motor-Driven Refrigerating Machines.

The use of ice to produce cold is passing away because it is uneconomical, unsatisfactory and unsanitary. Under the best of circumstances, much ice must go to waste because of the inherent difficulties of keeping it properly. Where there is ice there must be dampness, and damp wood, sawdust, and drains are always germ laden. The temperature produced by ice cannot be easily regulated, and the maximum degree of cold that can possibly be produced is not sufficient for many purposes. Moreover, the process of filling the ice chest always creates a mess, objectionable alike to the housewife and the business man, while the ever present dampness greatly lessens the life of the refrigerator.

Mechanical refrigeration eliminates all these disadvantages. It supplies dry cold of any desired degree; the temperature produced can be readily varied to suit different purposes; and experience goes to prove that, under average conditions, mechanical refrigeration is cheaper than ice.

The electric motor permits the use of mechanical refrigeration in very small units, which need little attention and that only of the kind the average janitor is competent to give.

These outfits are being used extensively by butchers, grocers, dairymen, hotels, restaurants, public institutions, large residences, etc., for preserving food and for making ice in small quantities. Ice cream plants find them far superior to salt and ice mixture for freezing and hardening the cream. Large industrial plants use them for cooling drinking water, which is pumped to fountains in all parts of the works. The florist finds a special application for preserving flowers and preventing buds opening until wanted for sale. Modern apartment houses supply each tenant with a mechanically cooled refrigerator thus eliminating the visits of the ice man.

The cost of operating varies, of course, with conditions, the principal items of the operating expense being for power, water, oil and ammonia. The last two are small, as little oil is needed and one charge of ammonia should last a year or two.

The cost of power depends on the size of the plant, 2 h.p. per ton of refrigerating capacity being the size of motor usually recommended. The illustration shows a 10 h.p. Westinghouse motor driving a Brench refrigerating machine.

AUTOMATICALLY SWITCHING APPARATUS TO AUXILIARY SUPPLY MAINS.

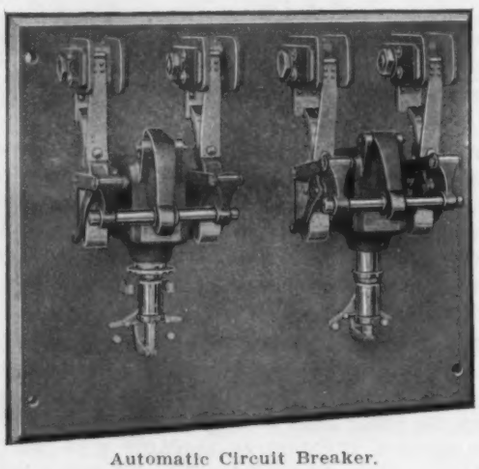
The maintenance of continuity of electric power service to electrical machinery, lighting circuits, signal apparatus, etc., make it imperative that a means be provided for switching on reserve power instantly to supply current in case of failure of the main source of power.

The circuit breaker shown in the illustration is designed for such service, and yet it is so simple in construction and in operation that it is thoroughly dependable.

It consists of two double-pole, single-coil, solenoid operated, magnetic blowout circuit breakers, each of which remains closed only while the current is on the solenoid, and drops out by gravity when this current is interrupted.

The circuit breaker on the left is in the main supply circuit and, under-normal operating conditions, is closed, while the one on the right is open.

When the main source of supply fails, the circuit breaker on the left opens owing to its solenoid being de-energized and the metallic disc directly underneath this solenoid and fastened to its core, bridges the gap between the two rectangular contacts blocks just below it as the core falls. The closing of this circuit connects the operating coil of



Automatic Circuit Breaker.

the circuit breaker on the right across a storage battery or other auxiliary source of current, and energizes its solenoid, which instantly forces the circuit breaker closed and permits current to be supplied from the auxiliary source of power, thus avoiding any interruption of service. When the regular power service is restored, the solenoid of the circuit breaker on the left is again energized, causing the circuit closing disc to be withdrawn from the rectangular contact

blocks, this action breaking the circuit of the solenoid of the circuit breaker on the right, which latter opens at once, cutting off the supply of current from the auxiliary power source.

The circuit breaker at the left of the illustration will be closed at all times except when the regular power supply fails and the apparatus must be switched on to the auxiliary source of power. The interruption due to the change from one line to the other lasts merely a fraction of a second and so operation is practically continuous regardless of the number of changes of the supply circuit. The circuit breaker described above is manufactured by the General Electric Company, Schenectady, N. Y.

THE WIRE INDUSTRY.

Statistics for the wire industry in the United States for 1909 are presented in detail in a bulletin soon to be issued by Director Harris of the Bureau of the Census, Department of Commerce. It was prepared under the supervision of Wm. M. Steuart, chief statistician for manufactures.

Of the 93 establishments in the industry in 1909, 59 drew iron and steel wire exclusively, seven drew copper wire exclusively, six drew wire from materials (chiefly brass) other than iron and steel or copper, while 21 drew wire from two or more of the metals.

Of the total cost of wire rods used by the industry as a whole, 60 per cent represented the cost of iron and steel rods, 36.3 per cent that of copper rods, and 3.8 per cent that of rods of other metals or alloys.

The wire departments of rolling mills and other concerns produced 66.7 per cent of the total tonnage of steel and iron wire and wire goods reported in 1909, and 94 per cent of the tonnage of wire and wire products of brass and other metals (except copper or alloys), but produced only 33.5 per cent of the product from copper.

The manufacture of insulated wire and cable to the value of $9,806,989 was reported by the establishments in the wire industry in 1909. Most insulated wire is made by establishments in the industry designated as "electrical machinery, apparatus, and supplies." The total value of the insulated wire and cable manufactured in 1909 was $51,624,737.

In the production of steel and iron wire, Pennsylvania led in 1909 with 851,448 tons, or 35.6 per cent of the total amount drawn. In the production of copper wire New Jersey led with 63,452 tons, or 43.1 per cent of the total; and in the manufacture of wire from brass and other metals or alloys Connecticut was far in advance of any other state, producing 32,304,963 pounds, or 92.8 per cent of the total output.

TRADE NOTES.

The Joshua Hendy Iron Works, San Francisco, are installing a 400 h.p. tangential water wheel at Elko, Nevada.

The St. Paul & Tacoma Lumber Company, Tacoma, is running two 6-ton electric locomotives equipped with Edison storage batteries.

The Gale Creek Coal Company of Wilkeson, Washington, is installing a Corliss engine, together with General Electric generator and pumps.

The Sound Manufacturing Company, Seattle, has just received a large order for steel cabinets from the local branch of the Western Electric Company.

The General Electric Company, Seattle, has secured a contract for supplying the Van Ness Lumber Company at Winlock, Washington, with a 500 kw. steam turbine with switchboard and exciters.

The Arrow Electric Company, Seattle, is installing a large electric sign on the Burke building. The cost of wiring approximates $2000. This company will shortly open a branch office at Redmond, Wash.

The General Package Manufacturing Company, Aberdeen, Washington, will install a 50 h.p. Allis-Chalmers motor. A number of motors made by this company are used in the plant which is motor driven throughout.

W. R. Hendry & Company were the low bidders on the winding drum equipment for operating the marine railway to be used in handling 75 ton boats in connection with the Salmon bay project of the Seattle port commission.

The Berkeley Electric Cooker Company, Berkeley, Cal., has received an order from the Decew Electric Company, Ltd., Winnipeg, Manitoba Province, Canada, for 100 Type C cookers. Another order for 50 cookers has been received from the H. Brown Company at Norwood.

The General Electric Company, Tacoma, is supplying the Buffelen Lumber & Manufacturing Company with a 250 kw., 440 volt., a.c., three-phase generator, direct connected to a Buckley engine. Colman & Hahn, Tacoma are making the installation.

The Portland Bronze & Crucible Steel Company, Portland, have purchased from the Westinghouse Electric & Manufacturing Company, a 300 k.v.a. oil cooled transformer and two small induction motors for use in their factory. The electric furnace will be built in Portland under French patents.

The Twin City Electric Company, Raymond, Washington, recently purchased through its New York representatives, Sanderson & Porter, one 75 kw. synchronous motor generator set and one 8 panel switchboard, all of Westinghouse Electric & Manufacturing Company make.

Meese & Gottfried Company, Pacific Coast manufacturers of transmission, elevating, conveying and screening machinery have obtained a ten-year lease on the four-story building at the corner of Mission and Annie streets, San Francisco, and will move into their new quarters this week. They will occupy the entire building.

The Tacoma Electric Machinery Company, Tacoma, announces that considerable money has been added to the business which will be greatly extended. This company has recently installed an electric crane for the Walker Cut Stone Company and has the contract for installing a second 50 h.p. variable speed motor in the Tribune building.

The Westinghouse Electric & Manufacturing Company, have recently sold to Mr. S. S. Bullis, Medford, Ore., a 200 kw., three-phase, 60 cycle, 2200 volt synchronous motor direct connected to a 600 volt interpole railway type, d.c. generator. The set is to be used on the Southern Oregon Traction Company's street railway system in Medford. This company also sold four motors aggregating 330 horsepower to the Pacific Bridge Company for their rock crushing plant at Mosier, Oregon.

The Reynolds Electric Company, Seattle, has sold to Captain Ramwell of the American Tug Boat Company a lighting plant and storage battery for his private yacht. The lighting plant will consist of a 5 h.p. direct-conncted gas engine and generator 500 ampere U.S.L. battery. A sale of two direct connected Engberg lighting sets and two direct connected gasoline driven centrifugal pumps for use on tug boats was made to the American Tug Boat Company.

Charles C. Moore & Company, Seattle, have been awarded a contract by the city of Kamloops, B. C., to supply two Platt Iron Works 1100 h.p. turbine water wheels. Lombard governors and accessories. The contract for generators was awarded to the Canadian Westinghouse Electric & Manufacturing Company, and for switchboard and transformers to the Canadian General Electric Company. Charles C. Moore & Company will have charge of construction. Ducane & Dutcher of Vancouver, B. C., are consulting engineers on the job.

NEWS NOTES

INCORPORATIONS.

OAKDALE, CAL.—The Oakdale Gas Company has been incorporated for $75,000, by J. R., M. M. and C. W. Anderson.

LOS ANGELES, CAL.—Articles of incorporation for the Hanson Wireless Telephone & Telegraph Company, with a capital stock of $25,000 has been filed by C. L. Hanson, H. La V. Twiniax and L. Fall.

ILLUMINATION.

GLENDALE, CAL.—Sealed bids will be received up to August 25th for a gas franchise.

LOS ANGELES, CAL.—The board of works has approved plans for the installation of street lights in Gardena district of the city by the California Edison Company.

ANACONDA, MONT.—A resolution and petition for an ornamental lighting system in the business district was presented to the city council.

QUINCY, CAL.—The local electric light plant, owned by F. G. Gansmer, was destroyed by fire recently. Gansmer states that he will order new machinery at once and will have the plant in operation again within two or three weeks.

ANTIOCH, CAL.—The town of Antioch has filed suit against the Great Western Power Company to cancel the franchise granted it for the erection of poles along the streets of the town.

CLATCKANIE, ORE.—The electric light plant of this place has changed hands and the new management, of which W. W. Seymour is president, has undertaken to enlarge and improve the plant. An addition will be built to the powerhouse and new machinery will be put in.

VANCOUVER, WASH.—An application to the county commissioners has been presented by the Independent Electric Company for a franchise for light and power from the Clark county end of the Woodland bridge to La Center and from La Center along the Pacific Highway to Vancouver. The date of the hearing of the franchise has been set for August 6. H. G. Fleischhauer, purchasing agent of the Washington-Oregon Corporation is one of the applicants for the franchise.

SPOKANE, WASH.—Commissioner of Public Utilities C. M. Fassett presided at the first meeting of the special committee appointed by the city council to inquire into the possibility of the aquisition by purchase or condemnation of a power site on the Spokane River for a municipal lighting plant. It is estimated that it will require $1,000,000 to erect a suitable dam and purchase a power site and possibly another $1,000,000 to get the lines and conducts laid for operation in the city.

PORTLAND, ORE.—Judge Gatens has returned a decision that the 3 per cent gross earnings tax imposed on gas and electric companies by a city ordinance passed by the people June 5, 1911, is inoperative, basing his ruling on the opinion that under the old city charter, in force when the ordinance was passed, the city had no power to levy such a tax. The companies affected are the Portland Railway, Light & Power Company and the Mount Hood Railway Company, an independent corporation at the time of the passage of the ordinance, but now a subsidiary of the Portland Railway, Light & Power Company.

ELY, NEV.—It is reported that the Ely Light & Power Company will appeal from the recent ruling of the Public Service Commission of Nevada ordering a reduction in rates for light and power, and that the question will be taken to the courts for settlement. The ruling of the commission has been severely criticized by many commercial men, for the reason that they ordered the company to discontinue a readiness-to-serve form of rate and to substitute therefor a block system of rates, declaring that it was unfair and discriminatory to charge the customer with a low load factor a higher rate for energy than the customer with a high load factor.

TRANSMISSION.

BISHOP, CAL.—The Bishop Creek plants of the Nevada-California Power Company will be connected with the mining district of Bodie. Field Engineer Rhudy has begun a survey for the new line.

SEATTLE, WASH.—The Puget Sound Traction Light & Power Company has obtained franchises from the county commissioners for the placing of poles and stringing wires along the county roads to Kirkland and Redmond and over certain streets north of Eighty-fifth street. The franchise is for 50 years.

SAN FRANCISCO, CAL.—Authority has been granted by the Railroad Commission to the Pacific Gas & Electric Company to purchase ditches and water rights from the United Water & Power Company. The water rights thus acquired are to be used for the further development of the Bear River hydroelectric projects in Placer county.

BEND, ORE.—The appointment of Vernon A. Forbes of this city as one of the two House members of the Celilo Commission has been announced. This commission is empowered to act with the State Engineer in investigating the power possibilities of the Celilo Falls on the Columbia River, for which work $15,000 has been appropriated. The commission has authority to make contracts with the State of Washington and the federal government should co-operative development seem advisable.

GREAT FALLS, MONT.—The Montana Power Company is making good progress with its large projects at Thompson Falls on Clarks Fork of the Columbia River in Montana, where a 30,000 kw. power project is being developed and near Great Falls on the Missouri River, where a 60,000 kw. project is under way. At Great Falls there is a head of 80 ft. and 70 ft. dam giving a total of 150 ft. The 110,000 volt transmission line will be paralleled with the other plants of the system. Charles T. Main and Henry A. Herrick are the engineers in charge, the latter making his home at Great Falls during the construction period.

CASHMERE, WASH.—O. B. Hollis and H. H. Dickson of Spokane were here recently investigating the hydroelectric proposition of O. H. Carter, J. M. Crom, and L. H. Titchenah. They were accompanied by Jean F. Reynaud, an electrical and hydraulic engineer, who made a favorable report and a deal was closed with the owners, whereby the site and water rights were transferred to Hollis & Dickson. Development work will start within 40 days. A head of 10 ft. can be obtained by constructing a three foot dam across the river 2000 ft. above the power house. Water will be conveyed to the powerhouse by a ditch and flume. The company will be capitalized at $100,000.

TRANSPORTATION.

PITTSBURG, CAL.—The board of trustees have granted a franchise to the Oakland, Antioch & Eastern Railroad.

KLAMATH FALLS, ORE.—A meeting was held at Bonanza recently when a number of boosters from that section and from Klamath Falls gathered to discuss plans for inducing capitalists to build the Bonanza Klamath Interurban Railway.

BUTTE, MONT.—The first of the center entrance pay-as-you-enter cars were placed in operation in Butte last week. The P-A-Y-E system of collection will not be used until the company has more cars equipped.

FRESNO, CAL.—A project is on foot in Fresno for the establishment of a second street car system. The promoters have outlined routes, covering practically every portion of the city, and it is asserted that the plan is to make the new lines competitors of the Fresno Traction Company. F. F. Wright of the Fresno Home Builders, is one of the parties interested in the promotion of the new street railways.

SAN LEANDRO, CAL.—Negotiations to secure a right of way into the center of San Leandro for their suburban electric service are being conducted by the Southern Pacific Company. The line is already completed to Dutton avenue near the western limits of San Leandro, and it is the intention of the company to extend the line as far as Estudillo avenue in the center of the town as soon as a right of way can be secured.

SEATTLE, WASH.—The Seattle city council, with a view to taking over the property of the Lake Burien Railway Company, has passed a resolution directing the city comptroller to examine and check over the company's books of account and directing the engineering department and the department of public utilities to check over and verify all properties included in the rights of way of the company, the results to be transmitted to the corporation counsel.

SALT LAKE CITY, UTAH.—The scheme of pay-as-you-enter as applied to Salt Lake street car operation on South Temple street has been found to be working so satisfactorily that General Manager Joseph S. Wells of the Utah Light & Railway Company has ordered that fifty-four additional cars be made over to the P-A-Y-E type. When these are finished, all of the newer type of street cars in Salt Lake City with large enough platform will be P-A.Y.E cars.

SEATTLE, WASH.—The public utilities committee of the city council voted to recommend that an offer of $1,250,000 be made for the entire property of the Seattle, Renton & Southern Street Railway Company. This includes a double track line extending from Third avenue and Stewart street on the north, to the city of Renton on the south, a distance of nine miles, about one-half of which lies within the city limits and the other half in King county. The property was offered to the city recently for $1,400,000.

LOS ANGELES, CAL.—Expenditure of more than a half-million dollars for installation of safety devices, probably beginning a campaign which will place all of its lines under block signal system, has been outlined by the Pacific Electric Railway at a hearing of the State Railroad Commission. Plans were outlined by E. A. Roome, superintendent of telegraph, telephone and signals, under sanction of President Paul Shoup. Work is to begin at once on part of the line, from Vineyard to Venice, on Pasadena short line and the Covina line.

PORTLAND, ORE.—The Portland, Eugene & Eastern Railway Company have begun laying steel on Fourth street, where electric interurban trains are to supersede the use of steam power which the Southern Pacific Company will abandon for the more modern method of transportation. Reports from Oswego say that construction of the new power station has begun while Ralph E. Moody, general counsel for the company, filed suit at Oregon City against the Oregon Iron & Steel Company for condemnation of a right of way for the main line through the property of the steel manufacturing company.

SAN RAFAEL, CAL.—S. J. Norton of the San Rafael & San Anselmo Valley Railway, appeared before the State Railroad Commission with a petition for incorporation of the company. This new line, which will be operated as the San Rafael & San Anselmo Valley Railway Company, will run from the Puerto Suello on Petaluma avenue in San Rafael, out Fourth street to a point about half a mile westerly to Fairfax and will touch at the union station, San Rafael. The cost of the road, which will be about six miles in length, will be about $100,000, and it will take about six months to build. The company will be capitalized at $100,000, divided into 4000 shares of the par value of $25 each. Of the proposed bond issue of $100,000, $50,000 has already been disposed of. The necessary franchises through San Rafael, San Anselmo and the county of Marin have already been secured and the bonds called for by said franchises, amounting to $8000 filed. Cars will run each way daily every 20 minutes from 6 a. m. to 12 p. m. and the fare for all or any portion of the trip will be 5 cents. Beach storage battery cars will be used, requiring neither trolley nor third rail.

TELEPHONE AND TELEGRAPH.

GLENDALE, CAL.—Pacific Telephone & Telegraph Company has been granted a franchise to construct and operate a telephone and telegraph system at this place for a period of 25 years.

COLUSA, CAL.—Former Supervisor J. F. Campbell and representatives of the Colusa Telephone Company have applied to the board of supervisors of Sutter county for a franchise to erect poles and lines and maintain and operate a telephone system in that county.

RIVERSIDE, CAL.—Sealed bids will be received up to August 20th, at the office of the board of supervisors of Riverside county, for certain franchise granting right to erect or lay telegraph or telephone poles and wires, and the right to construct and maintain same for a period of 50 years.

PORTLAND, ORE.—Suit was begun here in the name of the United States against the American Telephone & Telegraph Company and its subsidiaries, charged with absorbing independent companies in order to destroy competition and create a monopoly. The attorney-general asks the court to compel the corporation to relinquish control of the Independent Telephone Company of Seattle, the Home Telephone Company of Puget Sound, the Northwestern Long Distance Telephone Company, the Interstate Consolidated Telephone Company and the Independent Long Distance Telephone Company. If necessary to accomplish the dissolution, the court is asked to appoint a receiver for the properties. An immediate injunction or restraining order is asked by the government to prevent any further steps, in pending foreclosure suits, to transfer the physical properties of the Northwestern Long Distance Telephone Company to the Bell companies.

WATERWORKS.

OLYMPIA, WASH.—This place has voted to bond in the sum of $150,000 for the purpose of constructing a municipal water system.

HOQUIAM, WASH.—A mortgage for $300,000 has been filed for the extension of the water works system. The mortgage covers between 3000 and 4000 acres of land as well as the water plant.

CULBERTSON, MONT.—A formal tender was made by Superintendent Caldwell and A. S. Huyk of the American Water & Light Company to turn over the water system to the city of Culbertson, but they failed to agree on terms.

PILOT ROCK, ORE.—Bonds for $1,200,000 were voted at an election held by the Teel Irrigation District. Engineers are at work surveying the power resources of the project. Consideration is being given to plans and specifications for the reservoir. The water will be taken from Camas and Hidaway creeks. It is thought that operation will start within the next six months.

ALPHABETICAL INDEX TO ADVERTISERS

Aluminum Company of America.....
Benjamin Electric Manufacturing Company.....
Berkeley Electric Cooker Co.....15
Bonestell & Company..... 17
Bowie Switch Company, The.....
Bridgeport Brass Company..... 4
Byron Jackson Iron Works, Inc..... 15
Century Electric Company..... 15
Connecticut Telephone and Electric Company .....
Crocker-Wheeler Company 8
Crouse-Hinds Company.....
Cutler-Hammer Manufacturing Company..... 16
D. & W. Fuse Company..... 11
Dearborn Drug & Chemical Works..... 8
Edison Storage Battery Supply Company 8
Electric Storage Battery Company.....17
Fairbanks, Morse & Co.....
Fort Wayne Electric Works.....
General Electric Company..... 18-19
Habirshaw Wire Company.....11
Hemingray Glass Company.....11
Holtzer-Cabot Electric Company, The.....13
Hughes & Company, E. C..... 8
Hunt, Mirk & Company.....
Indiana Rubber & Insulated Wire Company.....13
Johns-Manville Company, H. W.....17
Kelman Electric Company 4
Klein & Sons, Mathias.....20
Locke Insulator Manufacturing Company..... 4
Lombard Governor Company.....
Mannesmannrohren-Werke .....
McGlauflin Manufacturing Company.....
Moore & Company, Engineers, Chas. C.....
New York Insulated Wire Company..... 17
Northwestern Pacific Railways.....
Okonite Company 20
Ohio Brass Company..... 13
Pacific Electric Manufacturing Company.....
Pacific States Electric Company..... 2
Pelton Water Wheel Company..... 8
Pierson, Roeding & Company..... 4
Pittsburg High Voltage Insulator Company, The..... 5
Pittsburg Piping & Equipment Company.....20
Schaw-Batcher Company Pipe Works, The..... 8
Simplex Electric Heating Company.....20
Southern Pacific Company.....20
Sprague Electric Works..... 5
Standard Underground Cable Company.....20
Thomas & Company, R..... 11
Wagner Electric Manufacturing Company..... 5
Western Electric Company.....11
Westinghouse, Church, Kerr & Co.....
Westinghouse Lamp Company .....
Westinghouse Electric & Manufacturing Company..... 6
Westinghouse Machine Company .....
Weston Electrical Instrument Company..... 3

The Schaw-Batcher Co. Pipe Works
(INCORPORATED)

Manufacturers of **RIVETED IRON AND STEEL PIPE**

Tanks of all descriptions for Water, Oil and Gas. Single and Double Well Casing

OUR SPECIALTY: Riveted Pipe for High Pressure Engineers and Contractors for the complete installation of Pipe Lines used in the operation of Hydraulic Mines, Power Plants, Water Works, Irrigation, Reclamation, etc. We have special facilities for supplying general supplies for Mills, Mines, etc.

Office, 211 to 219 J Street Works, 15th and B Streets
SACRAMENTO, CAL.
San Francisco Office, 356 Market St. New York Office, 65 Reade St.

HIGH SPEED CONSTRUCTION
involving the handling of large quantities of dirt can be put through on schedule time by using Pelton Giants.
THE PELTON WATER WHEEL CO.
2219 Harrison Street, San Francisco
85 West Street, New York

E. C. HUGHES, PRESIDENT ADOLPH MEESE, SECRETARY
E. C. HUGHES CO.
PRINTERS -- ENGRAVERS -- BOOKBINDERS
LET US FIGURE ON YOUR CATALOGUE AND OTHER PRINTED MATTER
Printers and Binders of the Journal of Electricity and other Publications
147 to 151 Minna Street, San Francisco. Phone Kearny 806

EDISON BATTERIES—EFFICIENT—CONSTANT—DURABLE
Edison Storage Battery Supply Co.
E. M. Cutting, Manager
California District
Office and Supply Rooms
818 Mission St., San Francisco
Telephone Sutter 4438

Dearborn Chemical Company
Manufacturers of Water Treating Preparations to prevent scale, corrosion, pitting and foaming in Steam Boilers
General Offices, Laboratories, and Works: Chicago
948 East Second St., Los Angeles, Cal. 250-254 Front St., San Francisco, Cal.

Motors For All Purposes There is a Crocker-Wheeler Motor for every kind of work. We will gladly advise you as to the best apparatus for your particular requirements. Estimates cheerfully and promptly furnished. The complete Crocker-Wheeler line of motors, generators and transformers is described in illustrated booklet J.
A copy will go to you by return mail if you write today.
Offices in All Principal Cities **Crocker-Wheeler Co.,** Ampere, N. J.

The Watthour Meter
The Only UP-TO-DATE Meter Book on the Market
An illustrated book of 200 pages showing how the Watthour Meter is made, how it measures and records, how it is connected and how tested. Its theory is clearly explained without the use of higher mathematics and its practical operation and maintenance plainly and concisely set forth. The Watthour Meter is indispensable to Meter Man and Central Station Manager. Price $2
TECHNICAL BOOK SHOP, Rialto Building, San Francisco